

**UHCE OXFORD REPORT CR 16
TRAUMA AND ORTHOPAEDICS:
CASE FATALITY AND HOSPITAL RE-ADMISSION RATES**

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EXECUTIVE SUMMARY

Purpose of study

The Department of Health and the Healthcare Commission commissioned NCHOD to work with the Royal College of Surgeons and the British Orthopaedic Association to develop for trauma and orthopaedics a set of outcome indicators that could help clinicians and the Healthcare Commission.

Outline of study

The study is being carried in the following phases:

- Professional bodies contacted to nominate clinicians to work with NCHOD.
- Agreement reached between NCHOD and nominated clinicians about:
 - aggregations of activity and types of analysis to be done
 - specific operations and candidate indicators to be studied further.
- NCHOD develops detailed specifications for each of the candidate indicators to be agreed with the clinicians.
- NCHOD produces national figures for each candidate indicator to provide:
 - data about the number of events and admissions nationally so that the suitability of the indicator as a comparative measure could be assessed.
- NCHOD produces trust-based comparative figures for each of the candidate indicators considered suitable, with respect to numbers of events and admissions, to identify whether the measure is a useful comparative indicator.
- Agreement is reached between NCHOD and nominated clinicians about a set of indicators to recommend to the Department of Health and the Healthcare Commission for implementation.

Recommendations

Following discussions of these results with the collaborating clinicians, it is recommended that:

- CFRs should not be used as outcome indicators to screen elective admission activity. There are insufficient deaths for the results to be clinically relevant. More clinically relevant outcome information about elective activity may be obtained from the national registers of hip and knee replacements.
- Three 0-89 day CFRs for screening emergency admissions could be used. They are for:
 - emergencies with an operation
 - emergencies without an operation
 - emergencies with hip/femur procedures.
- Further work should be done on CFRs for admissions that start with a transfer to see whether these might be a clinically relevant measure of specialist trauma unit activity.

It should be noted that:

- Admissions that have suffered serious trauma are admitted to multi-specialty trauma units.
- Death from trauma usually occurs because of a related head, chest or abdominal injury not the orthopaedic condition.
- National information about trauma outcomes is best obtained from data returned through the Trauma Audit Research Network.

It is recommended that the following emergency re-admission (ERA) indicators could be used for comparing trust performance:

- General indicators, ERA rates for:
 - day cases
 - elective admissions with an operation
 - emergency admissions with an operation
 - emergency admissions without an operation.
- High volume operations, ERA rates for:
 - elective hip replacements
 - elective knee replacements
 - emergency hip/femur procedures.

Great care is required in interpreting the results of comparative ERA rate analyses.

1. BACKGROUND

Purpose of the study

The Department of Health and the Healthcare Commission commissioned the National Centre for Health Outcomes Development (NCHOD) at Oxford to work with the Royal College of Surgeons and the British Orthopaedic Association to develop for trauma and orthopaedics a set of outcome indicators that could help:

- Clinicians:
 - share information about prognosis with patients
 - assess outcomes in patients they have treated
 - compare outcomes of patients they have treated with colleagues' experience.
- Healthcare Commission to screen trusts as to whether their clinical performance needs further investigation.

Outcome indicators

For the purpose of studying outcomes, an indicator has been defined as an 'aggregated statistical measure, describing a group or whole population, compiled from measures on individuals that provide insights into the functioning of services'. Well-chosen indicators provide pointers as to where further investigation may be worthwhile but they do not necessarily provide definitive answers on whether services are good or inadequate.

As well as direct indicators of outcome such as mortality or re-admission rates, consideration in this study was given to the inclusion of proxy or indirect indicators of outcome such as the 'inappropriate' selection of cases.

Trauma and orthopaedics

Trauma and orthopaedics (T&O) can be described and classified by:

- bones and joints involved
- diagnoses or specific conditions
- operations done.

The bones and joints involved can be grouped anatomically as:

- spine
- hand, wrist, radius and ulnar
- shoulder girdle, elbow and humerus
- pelvis and acetabulum
- hip and femur
- knee, tibia and fibula
- ankle and foot.

The diagnoses can be grouped as:

- malignant neoplasms
- congenital malformations
- arthropathies
- dorsopathies
- soft tissue disorders
- osteopathies and chondropathies

- other musculoskeletal disorders
- injuries
- complications of surgery.

The operative procedures can be grouped as being related to:

- fascia, ganglion and bursa
- tendon and muscle
- spine
- bones and joints
- prosthetic replacements
- other operations on semilunar cartilage
- endoscopy
- fixation of joint
- reduction of traumatic dislocation
- amputation
- congenital disorders.

2. METHODS

Outline of the study

The study was carried in the following phases:

- Royal College of Surgeons and British Orthopaedic Association were contacted to:
 - participate in the study
 - nominate clinicians to work with NCHOD.
- Agreement was reached between NCHOD and nominated clinicians about:
 - aggregations of activity to be used for analysis
 - types of analysis to be done
 - specific operations to be studied
 - candidate indicators to be studied further.
- NCHOD developed detailed specifications for each of the candidate indicators which were agreed with the clinicians.
- NCHOD produced national figures for each candidate indicator to provide:
 - national information about prognosis
 - data about the number of events and admissions nationally so that the suitability of the indicator as a comparative measure could be assessed.
- NCHOD produced trust-based comparative figures for each of the candidate indicators considered suitable, with respect to numbers of events and admissions, to identify whether the measure was a useful comparative indicator.
- Agreement was reached between NHOD and nominated clinicians about a set of indicators to recommend to the Department of Health and the Healthcare Commission for implementation.

Groups of trauma and orthopaedics activity used

With the assistance of the collaborating clinicians a model of trauma and orthopaedics has been developed, dividing the activity into different groups relating to:

- Suitability for measuring the performance of the specialty
- Appropriateness of using indicators derived from a linked file
- Relative risk of the occurrence of adverse events.

The finished consultant episode (FCE) is the measure for counting specialty activity. From routinely collected data, a FCE can be classified as:

- One which is:
 - first FCE in a continuous in-patient spell (CIPS), or
 - subsequent FCE when the patient is transferred from the original specialty of admission.
- One containing:
 - diagnostic code for cancer, or
 - no such codes.
- If a first FCE, one with mode of admission (if known) coded as:
 - emergency, or
 - elective, or
 - transfer from another hospital.
- If an elective admission, one coded as:
 - day case intended to be and discharged on the same day, or
 - overnight stay.

- One in which:
 - an operative procedure took place, or
 - no operative procedure took place.

The diagnostic codes used to identify cancer patients were those used for the specification of clinical indicator AS401 and are ICD-10 codes C00-97, D37-48 and Z51.1 (patient on chemotherapy for cancer).

In specifying the groups which had operations, FCEs which only had certain operative procedure codes were excluded and included in the non-operation group. A list of these codes, developed for clinical indicator AS401, is shown at Annex A.

The collaborating clinicians have agreed that, when comparing performance between hospital trusts, only admissions with a T&O first FCE should be used. The quality of care given in the originating FCE will greatly influence that delivered in subsequent FCEs and, indeed, the transfer may often occur because an adverse event has occurred in the initiating FCE.

Admissions with cancer diagnoses have been separately identified and will generally be omitted from the analyses because the routine databases of HES and ONS mortality are poor sources from which to derive cancer outcome statistics in that:

- Cancer survival measures are more appropriate indicators for comparing performance than case fatality rates.
- Comparative cancer mortality performance needs to be based on cancer networks not individual hospitals or trusts.
- Cancer diagnoses are associated with a disproportionately high rate of deaths during or following admission, thus masking less common causes of death.

Previous NCHOD work has shown that FCEs with different modes of admission and with and without an operative procedure performed have varying risks of adverse events occurring after them. Day cases, discharged on the same day as admission, very rarely lead to significant adverse events and there is little purpose in producing linked file indicators for this group of patients. Any patient intended to be a day case but who died rather than being discharged should be the subject of an investigation.

Whether the remaining groups of activity can be used for producing comparative outcome indicators from a linked file is a matter of statistical power and will depend on the number of:

- adverse events being measured
- admissions in the group
- NHS trusts being compared.

For the calendar year 2000 there were 815,110 FCEs, of which 780,511(96%) were the first FCE in a continuous in-patient spell (CIPS). Of those FCEs which were not the first in a CIPS, 63% were in a CIPS in which the first FCE was also a T&O one.

Exhibit 1: Annual number of first FCEs and 0-29 day deaths and crude fatality rates (per 100 FCEs)

Group	FCES		0-29 day deaths		
	Number	%	Number	%	Rate %
With cancer diagnosis	9729	1.2	1079	11.5	11.0
Elective without cancer:					
• day cases	209732	26.9	42	0.5	0.02
• overnight with operation	230773	29.5	487	5.2	0.2
• overnight no operation	23183	3.0	85	0.9	0.4
Emergency without cancer:					
• with operation	191032	24.5	4212	45.0	2.2
• no operation	99165	12.7	2940	31.4	3.0
Transfer without cancer	13340	1.7	323	3.4	2.4
Mode NK without cancer	3557	0.5	195	2.1	5.5
<i>Total</i>	<i>780511</i>	<i>100.0</i>	<i>9363</i>	<i>100.0</i>	<i>1.2</i>

Exhibit 1 shows, for sub-groups of the first FCE admissions, the number admitted annually and the number and case fatality rate for deaths occurring 0-29 days after admission.

Further analyses were done for the groups of elective and emergency admissions which had operations. Consultant advisers proposed the following as potential groups for the production of outcome indicators:

- elective hip replacements
- elective knee replacements
- emergency operations on hip/femur.

Annex B shows the average annual number of procedure codes recorded for elective and emergency CIPS with a trauma and orthopaedics FCE (excluding day cases and those admissions with cancer diagnoses).

The elective hip replacement operative procedure codes used were W37-39 and W46-48. The elective knee replacement operative procedure codes used were W40-42.

The denominator of the indicator associated with emergency hip/femur procedures was defined as emergency admissions with:

- diagnosis codes S72.0, 72.1, 72.2 and 72.9, and
- any W operative code.

Exhibit 2 shows the W operative procedures commonly associated with the S72 diagnostic code.

Exhibit 2: Common operative procedures associated with admissions with a primary diagnosis of fractured proximal neck of femur

Operative procedure	% of admissions
W19. Primary open reduction and intramedullary fixation	14
W24. Closed reduction of fracture and internal fixation	8
W46. Prosthetic replacement of head of femur using cement	7
W47. Prosthetic replacement of head of femur no cement	7
W48. Other prosthetic replacement of head of femur	1
W20. Primary open reduction and extramedullary fixation	1
W26. Other closed reduction of fracture	0.7
W37. Total prosthetic replacement of hip joint using cement	0.6
W28. Other internal fixation of bone	0.6
W39. Other total prosthetic replacement of hip joint	0.01
W38. Total prosthetic replacement of hip joint no cement	0.01

Database used

The database used was a linked file of English hospital episodes and ONS mortality data developed at Oxford. Index admissions were for the calendar years 1999-2001 and there was a further 90 days of data to allow the recording of the events of interest post-admission.

Analyses done

The analyses which were done related to:

- Occurrence of death within a specified time of start of admission.
- Occurrence of a first emergency re-admission for any cause within a specified time of discharge from index admission:

Analyses of trends over time require a means of dividing time into discrete periods. For most specifications, only the first recorded admission in the year for an individual has been included in the indicator denominator. However, it is recognised that that the first recorded event may not necessarily be the first relevant event.

For most analyses, continuous in-patient spells starting with a trauma and orthopaedics FCE occurring in any position within the CIPS were used as the index admissions rather than finished consultant episodes. CIPS, relating to the duration of stay in a hospital, have been used rather than FCEs because they:

- are a more clinically relevant measure than FCEs
- obviate having to handle transfers between FCEs in an analysis.

Funnel plots

Results have been shown graphically as funnel plots which show standardised case fatality rates (SCFRs) on the y axis plotted against expected deaths on the x axis in a scatter plot. The horizontal line in the middle of each plot shows the national overall mortality rate around which the SCFRs cluster and this clustering is much more pronounced as the expected deaths get larger leading to a funnel shape. Poisson confidence intervals (95 and 99%) for each value of the expected are superimposed on top of the SCFRs. These confidence intervals are

tabulated values for expected deaths less than 100 and calculated from a formula giving approximate values for expected deaths greater than 100 (from Bland).

Similar plots were done for standardised ERA rates.

3. MORTALITY INDICATOR SPECIFICATIONS

Introduction

Death after a hospital admission may be an unavoidable event, a consequence of the natural history of illness or it may be an adverse event that reflects poorly on the care provided. Case fatality rates (CFR) are used by the Department of Health and the NHS to compare hospital performance and were recommended in five of the ten condition-specific reports published in 1999 by NCHOD:

- asthma
- acute myocardial infarction
- diabetes
- fractured proximal femur
- stroke.

Case fatality rates have also been used as clinical indicators and in star ratings. Those produced have included indicators for deaths within 30 days of:

- elective/emergency admission operation
- heart by-pass/angioplasty
- emergency admission for fractured hip
- emergency admission for acute myocardial infarction/stroke.

General specification issues

The index admissions used were CIPS with a trauma and orthopaedics first FCE (excluding cancer diagnoses) which were:

- Day cases
- Elective admissions with an overnight stay which did have an operation.
- Elective admissions with an overnight stay which did not have an operation
- Emergency admissions which did have an operation.
- Emergency admissions which did not have an operation
- Admissions starting with a transfer from another hospital
- Admissions with mode of admission unknown.

In addition analyses were done for the following groups of operations:

- elective hip replacements
- elective knee replacements
- emergency hip/femur procedures.

The issues that needed to be considered, in specifying the indicators, were:

- Inclusion of:
 - deaths recorded on death certificate *or*
 - deaths recorded on death certificate and/or HES record.
- Inclusion of:
 - all deaths recorded on death certificate regardless of cause *or*
 - deaths with specific diagnoses given as main cause of death *or*
 - deaths with specific diagnoses recorded anywhere on the record?
- Time interval from start of an index admission to death.

For all the specifications it was decided to include in the numerator, deaths:

- recorded on death certificate and/or HES
- from any cause.

For day case, elective admission and mode not known indicators, the time interval chosen was 0-29 days after start of index admission.

For emergency and transfer admission indicators, the time interval chosen was 0-89 days as the SMR for this period was markedly raised.

Case fatality rates were age/sex standardised. In common with the clinical indicator specifications, indirect standardisation was used and the indicators were standardised for age and sex. Indirect standardisation is to be preferred because it is:

- More robust with small numbers and avoids the distortions caused by direct standardisation based on unstable age-specific rates.
- More flexible with respect to future requirements such as standardising for other factors such as deprivation.

The effect of social deprivation was studied. The Index of Multiple Deprivation 2000 (IMD 2000), assigned for each patient to the patient's address at ward level, was used as the measure of socio-economic status. For each measure, the admissions were grouped into quintiles based on the patients' IMD2000 score. Case-fatality rates were calculated taking the number of admissions as the denominator and the number of deaths occurring within 30 or 90 days of admissions regardless of the place of death as the numerator. The case-fatality rates for the quintiles were indirectly age- and sex-standardised, taking all admissions for the condition as the standard. Confidence intervals for these rates were calculated (assuming a Poisson distribution for the observed numbers of deaths).

Specifications

The mortality indicators are:

- 1A. 0-29 day CFR for day cases
- 2A. 0-29 day CFR for overnight elective admissions which had an operation
- 3A. 0-29 day CFR for overnight elective admissions which did not have an operation
- 4A. 0-89 day CFR for emergency admissions which had an operation
- 5A. 0-89 day CFR for emergency admissions which did not have an operation
- 6A. 0-89 day CFR for admissions starting with a transfer
- 7A. 0-29 day CFR for admissions with mode of admission unknown
- 8A. 0-29 day CFR for elective hip replacements
- 9A. 0-29 day CFR for elective knee replacements
- 10A. 0-89 day CFR for emergency hip/femur procedures.

MORTALITY INDICATOR SPECIFICATIONS

Indicator type/number: Mortality 1A

Definition

Proportion of T&O day cases (excluding those with a cancer diagnosis) that died 0-29 days after the start of the index admission.

Denominator

T&O elective day case admission, occurring first in the calendar year for an individual:

- Day case defined as intended to be a day case and discharged same day as admission
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- All ages
- Both sexes.

Numerator

Death recorded 0-29 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included

Indicator type/number: Mortality 2A

Definition

Proportion of elective CIPS, starting with a T&O FCE (excluding day cases and those with a cancer diagnosis) in which an operative procedure took place, that died 0-29 days after the start of the index admission.

Denominator

Elective CIPS starting with a T&O FCE that had an operative procedure, occurring first in the calendar year for an individual:

- Day case admissions are excluded
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are excluded
- All ages
- Both sexes.

Numerator

Death recorded 0-29 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included

Indicator type/number: Mortality 3A

Definition

Proportion of elective CIPS, starting with a T&O FCE (excluding day cases and those with a cancer diagnosis) in which no operative procedure took place, that died 0-29 days after the start of the index admission.

Denominator

Elective CIPS starting with a T&O FCE in which no operative procedure took place, occurring first in the calendar year for an individual:

- Day case admissions are excluded
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are included
- All ages
- Both sexes.

Numerator

Death recorded 0-29 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included

Indicator type/number: Mortality 4A

Definition

Proportion of emergency CIPS, starting with a T&O FCE (excluding those with a cancer diagnosis) in which an operative procedure took place, that died 0-89 days after the start of the index admission.

Denominator

Emergency CIPS starting with a T&O FCE in which no operative procedure took place, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are excluded
- All ages
- Both sexes.

Numerator

Death recorded 0-89 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included.

Indicator type/number: Mortality 5A

Definition

Proportion of emergency CIPS, starting with a T&O FCE (excluding those with a cancer diagnosis) in which no operative procedure took place, that died 0-89 days after the start of the index admission.

Denominator

Emergency CIPS starting with a T&O FCE in which no operative procedure took place, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are included
- All ages
- Both sexes.

Numerator

Death recorded 0-89 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included.

Indicator type/number: Mortality 6A

Definition

Proportion of transfer CIPS, starting with a T&O FCE (excluding those with a cancer diagnosis) that died 0-89 days after the start of the index admission.

Denominator

CIPS started by a transfer from another hospital and starting with a T&O FCE, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- All ages
- Both sexes.

Numerator

Death recorded 0-89 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included.

Indicator type/number: Mortality 7A

Definition

Proportion of CIPS with mode of admission not known and starting with a T&O FCE (excluding those with a cancer diagnosis), that died 0-29 days after the start of the index admission.

Denominator

CIPS with mode of admission not known and starting with a T&O FCE, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- All ages
- Both sexes.

Numerator

Death recorded 0-29 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included.

Indicator type/number: Mortality 8A

Definition

Proportion of elective CIPS starting with a T&O FCE (excluding those with a cancer diagnosis) and having hip replacement recorded as the main operation, that died 0-29 days after the start of the index admission.

Denominator

Elective CIPS starting with a T&O FCE with hip replacement recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes W37-39 and W46-48
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- All ages
- Both sexes.

Numerator

Death recorded 0-29 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included.

Indicator type/number: Mortality 9A

Definition

Proportion of elective CIPS starting with a T&O FCE (excluding those with a cancer diagnosis) and having knee replacement recorded as the main operation, that died 0-29 days after the start of the index admission.

Denominator

Elective CIPS starting with a T&O FCE with knee replacement recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes W40-42
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- All ages
- Both sexes.

Numerator

Death recorded 0-29 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included.

Indicator type/number: Mortality 10A

Definition

Proportion of emergency CIPS starting with a T&O FCE (excluding those with a cancer diagnosis) and having a hip/femur procedure (associated with a fractured proximal neck of femur) recorded as the main operation, that died 0-89 days after the start of the index admission.

Denominator

Emergency CIPS starting with a T&O FCE and having a hip/femur procedure recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes any W
- Diagnostic codes S72.0, 72.1, 72.2, and 72.9
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- All ages
- Both sexes.

Numerator

Death recorded 0-89 days after start of index admission:

- Recorded on HES record and/or death certificate
- Deaths for all causes are included.

4. MORTALITY INDICATOR PLOTS

Funnel plots

Exhibits 3 and 4 show for each indicator the number of:

- trusts that had consistent codes across the three years that were analysed and had more than 100 eligible admissions
- admissions
- deaths
- case fatality rates (Exhibit 3 only).

The figures in Exhibit 3 are obtained from a file of T&O FCEs occurring first in a CIPS in 2000 and those in Exhibit 4 are CIPS starting with a T&O FCE in 1999-2001.

Exhibit 5 shows for the years 1999-2001 for indicators selected to proceed to plots:

- crude case fatality rate
- number and proportion of trusts that had CFRs which were outside the funnel plot 95% confidence limits.

Only indicators 4A-5A and 8A-10A had adequate numbers of admissions and deaths and high enough case fatality rates to proceed to doing plots showing relative trust performance. These are shown in Exhibits 6-10.

Funnel charts are a type of control chart which are useful when the sample size of plot data points vary. Control charts attempt to compare the degree of variation in some performance measure which was observed, compared to what would statistically be expected. The funnel charts we have presented show how SCFRs vary with expected deaths around the national average mortality rate. The Poisson confidence intervals represent the variation in SCFR we expect statistically. If only random variation is present for any given condition we would see 95% (for example), of the data points to be within these limits (for that level of confidence). In only presenting one set of confidence limits (for the expected deaths) the charts are clear and allow an idea of how much variation is present in the data to be ascertained quickly.

Thus the comparison of SCFRs (with confidence limits) to a national average to determine statistical significance means that the number of trusts appearing in Exhibit 5 will not correspond entirely to the number of trusts appearing outside the funnel limits, since they are calculated by two different methods.

Exhibit 3: Numbers of trusts, admissions and deaths and CFRs for year 2000 using FCE file

Indicator (days)	Number of trusts	Number of admissions	Number of deaths	CFR %
1A Day cases 0-29	199	209732	42	0.02
2A Elective with op 0-29	196	230773	487	0.2
3A Elective no op 0-29	197	23183	85	0.4
4A Emergency with op 0-89	189	191032	8978	4.7
5A Emergency no op 0-89	190	99165	4859	4.9
6A Transfer 0-89	193	13340	494	3.7
7A Mode not known 0-29	185	3557	195	5.5

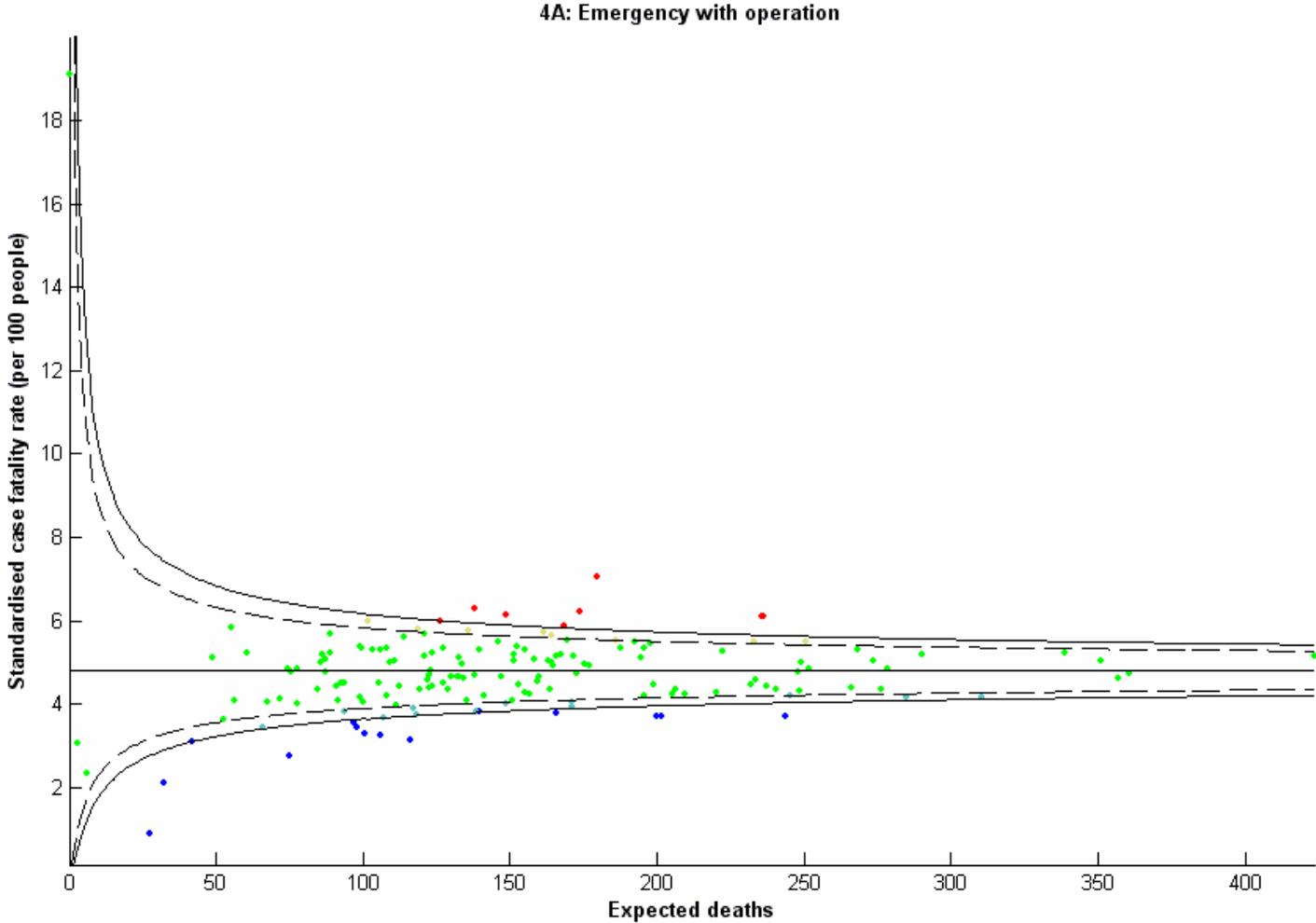
Exhibit 4: Numbers of trusts, admissions and deaths 1999-2001 using CIPS file

Indicator (days)	Number of trusts	Number of admissions	Number of deaths
4A Emergency with op 0-89	160	503614	24016
5A Emergency no op 0-89	160	237569	11665
8A Elective hip replacement 0-29	155	100498	529
9A Elective knee replacement 0-29	155	82762	376
10A Emergency hip/femur 0-89	153	103765	15543

Exhibit 5: 0-29 and 0-89 day crude CFRs and the number and proportion of trusts with CFR values outside 95% observed confidence intervals for 1999-2001 using CIPS file

Indicator (days)	CFR %	Number and (%) of trusts outside CIs
4A Emergency with op 0-89	5	41 (26)
5A Emergency no op 0-89	5	44 (27)
8A Elective hip replacement 0-29	0.5	3 (2)
9A Elective knee replacement 0-29	0.5	3 (2)
10A Emergency hip/femur 0-89	15	46 (30)

Exhibit 6: Mortality indicator 4A



Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 7: Mortality indicator 5A

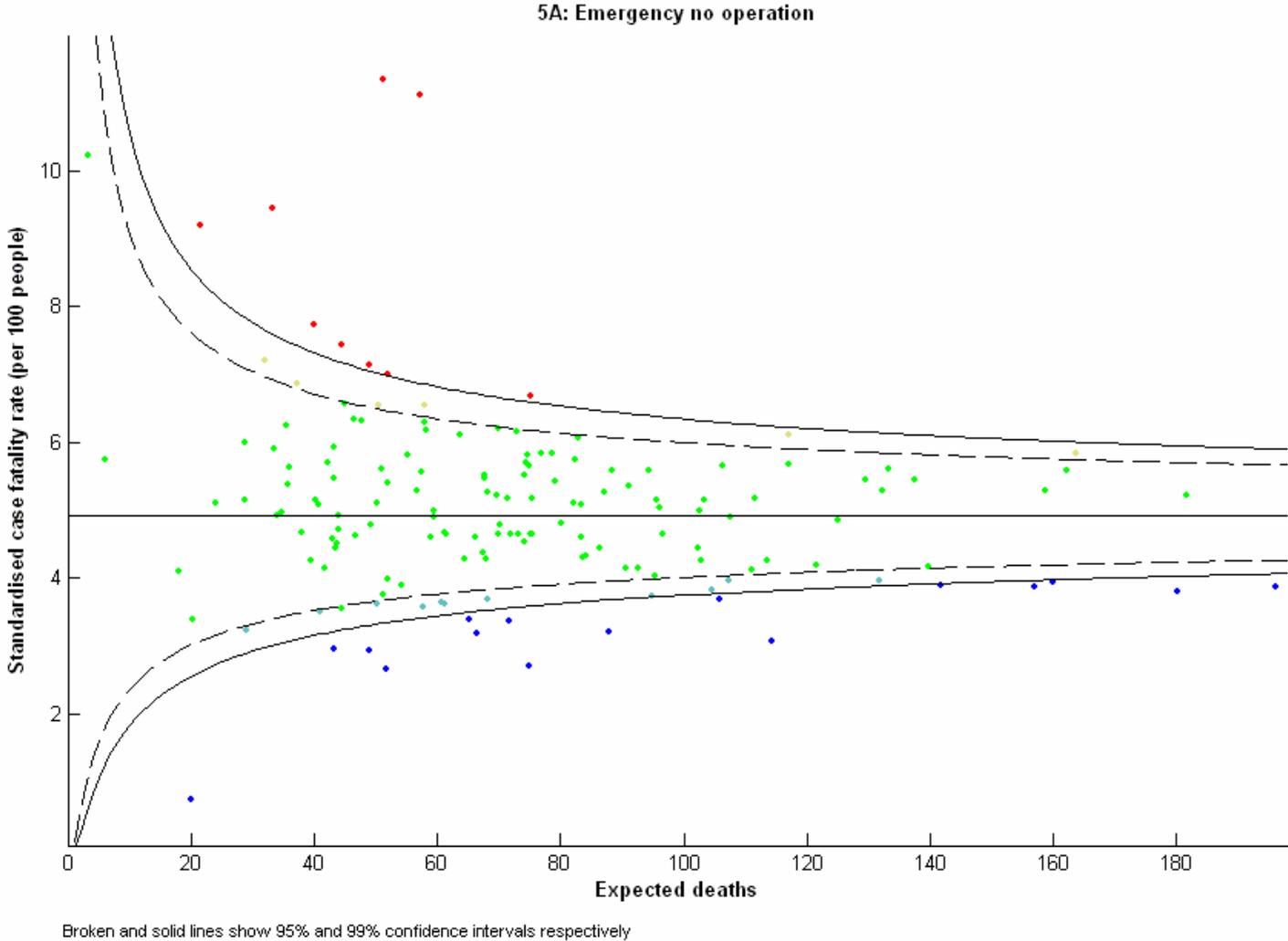


Exhibit 8: Mortality indicator 10A

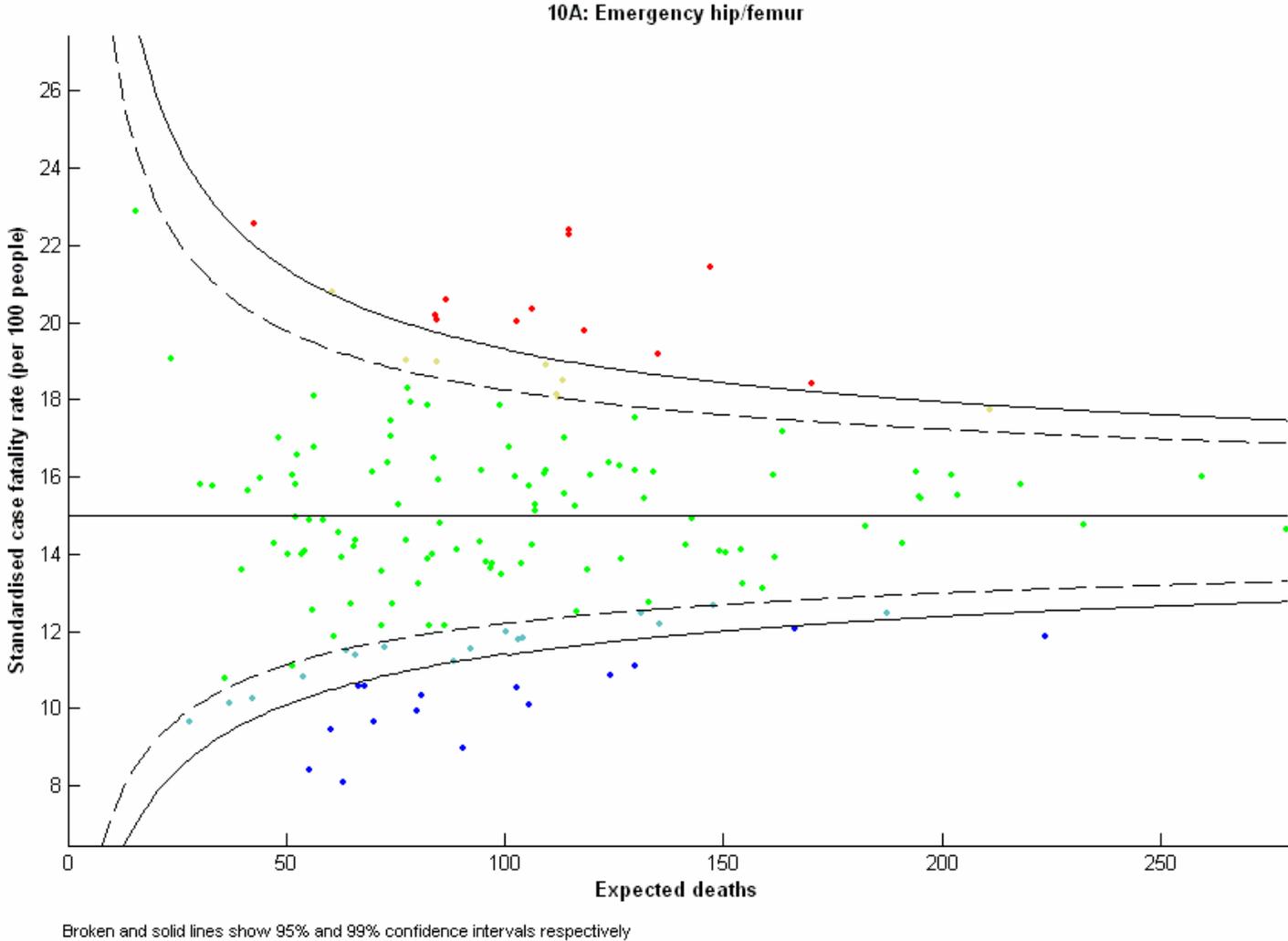
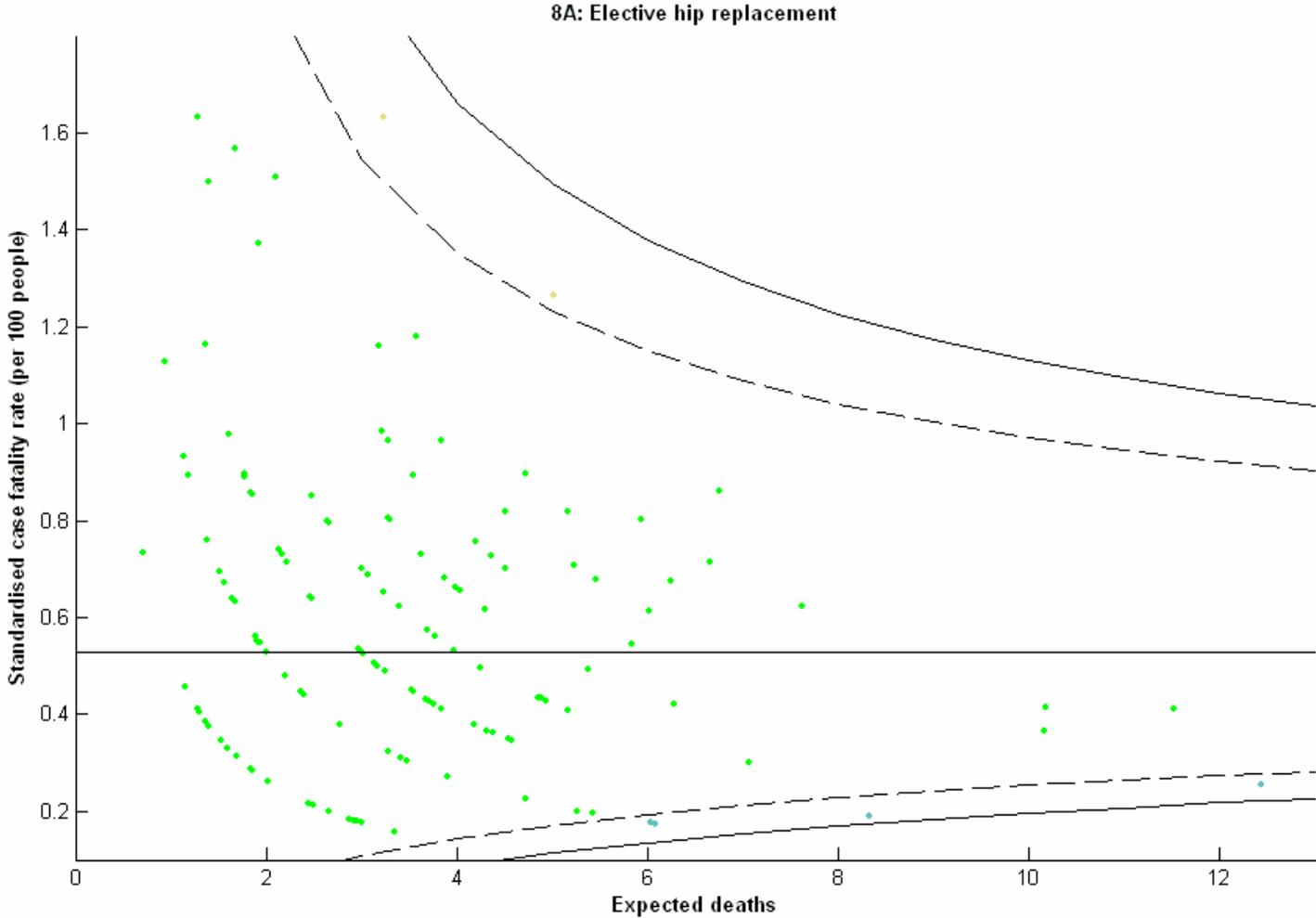


Exhibit 9: Mortality indicator 8A



Broken and solid lines show 95% and 99% confidence intervals respectively

5. EMERGENCY RE-ADMISSION INDICATOR SPECIFICATIONS

Introduction

Emergency re-admission (ERA) after hospital care may be a consequence of a wide range of factors including:

- natural progression of a patient's disease
- too early discharge from hospital
- sub-optimal care during the initial admission
- inadequate resources outside hospital.

Indicators based on emergency re-admission rates are considered to be a potentially useful means of comparing hospital performance and have been recommended in seven of the ten reports on specific conditions published in 1999 by NCHOD:

- asthma
- acute myocardial infarction
- cataract
- fractured proximal femur
- incontinence
- severe mental illness
- stroke.

Re-admission rates are used as clinical indicators and in star ratings. Those produced have included indicators for emergency re-admission within 30 days of an admission:

- in which a hysterectomy was performed
- in which a hip replacement operation was performed
- for fractured hip
- for stroke
- of an older person.

General specification issues

The index admissions used were CIPS with a trauma and orthopaedics first FCE (excluding cancer diagnoses) which were:

- Day cases
- Elective admissions with an overnight stay which did have an operation.
- Elective admissions with an overnight stay which did not have an operation
- Emergency admissions which did have an operation.
- Emergency admissions which did not have an operation
- Admissions starting with a transfer from another hospital
- Admissions with mode of admission unknown.

In addition analyses were done for the following groups of operations:

- elective hip/femur procedures
- elective knee procedures
- emergency hip/femur procedures

The issues that needed to be considered, in specifying the indicators, were:

- Time interval from end of an index admission to start of first emergency re-admission.

- Inclusion of:
 - deaths occurring in specified time period after end of index admission
 - same day re-admissions
 - index admissions with disposals other than home.
- Inclusion of all first emergency re-admissions or only those with specific diagnostic codes.

For day case, elective admission and mode not known indicators, the time interval chosen was 0-29 days from end of index admission. For emergency and transfer admission indicators, the time interval chosen was 0-89 days as the SMR, a proxy for the occurrence of adverse events, for this period was markedly raised.

Admissions were excluded from the analyses if the patient died during the index admission or during the time over which the index was being derived (29 days elective and 89 days for emergency admissions).

Index admissions were specified to include only those with a discharge home and, in these circumstances, same day re-admissions were included in the denominator. If admissions with other methods of disposal are included, it is difficult to distinguish genuine same day re-admissions from coding errors.

Initial analyses were done for all first emergency re-admissions regardless of diagnostic codes.

Emergency re-admission rates were age/sex standardised. In common with the clinical indicator specifications, indirect standardisation was used and the indicators were standardised for age and sex. Indirect standardisation is to be preferred because it is:

- More robust with small numbers and avoids the distortions caused by direct standardisation based on unstable age-specific rates.
- More flexible with respect to future requirements such as standardising for other factors such as deprivation.

Specifications

The emergency re-admission indicators are:

- 1A. 0-29 day ERA for day cases
- 2A. 0-29 day ERA for overnight elective admissions which had an operation
- 3A. 0-29 day ERA for overnight elective admissions which did not have an operation
- 4A. 0-89 day ERA for emergency admissions which had an operation
- 5A. 0-89 day ERA for emergency admissions which did not have an operation
- 6A. 0-89 day ERA for transfer admissions
- 7A. 0-29 day ERA for admissions with mode of admission unknown
- 8A. 0-29 day ERA for elective hip replacement
- 9A. 0-29 day ERA for elective knee replacement
- 10A. 0-89 day ERA for emergency hip/femur procedures.

RE-ADMISSION INDICATOR SPECIFICATIONS

Indicator type/number: Re-admission 1A

Definition

Proportion of T&O day cases (excluding those with a cancer diagnosis) that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

T&O elective day case admission, occurring first in the calendar year:

- Day case defined as intended to be a day case and discharged same day as admission
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 2A

Definition

Proportion of elective CIPS, starting with a T&O FCE (excluding day cases and those with a cancer diagnosis) in which an operative procedure took place, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a T&O FCE that had an operative procedure, occurring first in the calendar year for an individual:

- Day case admissions are excluded
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are excluded
- Admissions with disposals other than home are excluded
- Admissions ending in death or with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 3A

Definition

Proportion of elective CIPS, starting with a T&O FCE (excluding those with a cancer diagnosis) in which no operative procedure took place, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a T&O FCE in which no operative procedure took place, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are included
- Admissions with disposals other than home are excluded
- Admissions ending in death or with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included.
- Same day re-admissions are included.

Indicator type/number: Re-admission 4A

Definition

Proportion of emergency CIPS, starting with a T&O FCE (excluding those with a cancer diagnosis) in which an operative procedure took place, that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

Emergency CIPS starting with a T&O FCE in which an operative procedure took place, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are excluded
- Admissions with disposals other than home are excluded
- Admissions ending in death or with death occurring within 89 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included.
- Same day re-admissions are included.

Indicator type/number: Re-admission 5A

Definition

Proportion of emergency CIPS, starting with a T&O FCE (excluding those with a cancer diagnosis) in which no operative procedure took place, that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

Emergency CIPS starting with a T&O FCE in which no operative procedure took place, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are included
- Admissions with disposals other than home are excluded
- Admissions ending in death or with death occurring within 89 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included.
- Same day re-admissions are included.

Indicator type/number: Re-admission 6A

Definition

Proportion of transfer CIPS starting with a T&O FCE (excluding those with a cancer diagnosis) that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

CIPS starting with a transfer from another hospital and starting with a T&O FCE, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 89 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 7A

Definition

Proportion of CIPS with mode of admission unknown and starting with a T&O FCE (excluding those with a cancer diagnosis) that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

CIPS with mode of admission unknown and starting with a T&O FCE, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 8A

Definition

Proportion of elective CIPS starting with a T&O FCE (excluding those with a cancer diagnosis) and having hip replacement recorded as the main operation, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a T&O FCE and having hip replacement recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes W37-39 and W46-48
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 9A

Definition

Proportion of elective CIPS starting with a T&O FCE (excluding those with a cancer diagnosis) and having knee replacement recorded as the main operation, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a T&O FCE and having knee replacement recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes W37-39 and W46-48
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 10A

Definition

Proportion of emergency CIPS starting with a T&O FCE (excluding those with a cancer diagnosis) and having a hip/femur procedure (associated with a fractured proximal neck of femur) recorded as the main operation, that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

Emergency CIPS starting with a T&O FCE and having a hip/femur procedure recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes any W
- Diagnostic codes S72.0, 72.1, 72.2, and 72.9
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 89 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

6. RE-ADMISSION INDICATOR PLOTS

Funnel plots

Exhibits 11 and 12 show for each indicator the number of:

- trusts that had consistent codes across the three years that were analysed
- admissions
- emergency re-admissions.

The figures in Exhibit 11 are obtained from a file of T&O FCEs occurring first in a CIPS in 2000 and those in Exhibit 12 are CIPS starting with a T&O FCE in 1999-2001.

Exhibit 13 shows for the years 1999-2001 for indicators selected to proceed to plots:

- ERA rate
- number and proportion of trusts that had ERA rates which were significant at the 95% significance level using confidence intervals (CI) on the observed re-admissions.

Indicators 1A, 2A, 4A, 5A, 8A, 9A and 10A had adequate numbers of admissions and ERAs and high enough ERA rates to proceed to doing plots showing relative trust performance. These are shown in Exhibits 14-20.

Funnel charts are a type of control chart which are useful when the sample size of plot data points vary. Control charts attempt to compare the degree of variation in some performance measure which was observed, compared to what would statistically vary with expected ERAs around the national average rate. The Poisson confidence intervals represent the variation in standardised ERA rates we expect statistically. If only random variation is present for any given condition we would see 95% (for example), of the data points to be within these limits (for that level of confidence). In only presenting one set of confidence limits (for the expected deaths) the charts are clear and allow an idea of how much variation is present in the data to be ascertained quickly.

Thus the comparison of standardised ERA rates (with confidence limits) to a national average to determine statistical significance means that the number of trusts appearing in Exhibit 13 will not correspond entirely to the number of trusts appearing outside the funnel limits, since they are calculated by two different methods.

Exhibit 11: Number of trusts, admissions and re-admissions and ERA rates for year 2000 using FCE file

Indicator (days)	Number of trusts	Number of admissions	Number of re-admissions
1A Day cases 0-29	167	162215	1758
2A Elective with op 0-29	164	181733	6690
3A Elective no op 0-29	165	17627	522
4A Emergency with op 0-89	157	143223	14259
5A Emergency no op 0-89	156	66555	7521
6A Transfer 0-89	141	6965	824
7A Mode not known 0-29	95	593	39

Exhibit 12: Number of trusts, admissions and re-admissions and ERA rates for 1999-2001 using CIPS file

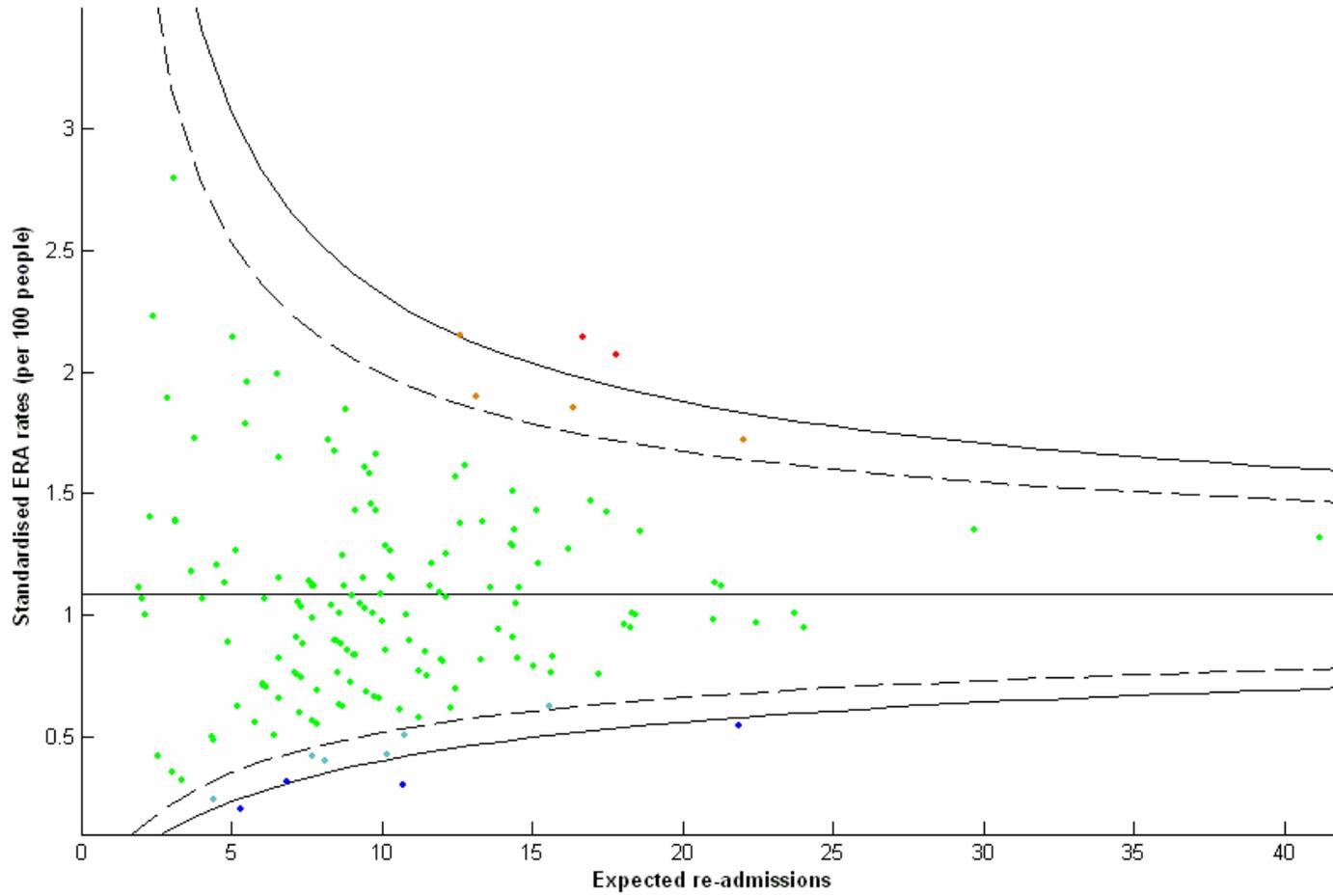
Indicator (days)	Number of trusts	Number of admissions	Number of re-admissions
4A Emergency with op 0-89	160	436672	44147
5A Emergency no op 0-89	160	201391	23331
8A Elective hip replacement 0-29	155	93348	6279
9A Elective knee replacement 0-29	154	78387	4484
10A Emergency hip/femur 0-89	154	79930	12299

Exhibit 13: 0-29 and 0-89 ERA rates and the number and proportion of trusts with ERA values which were significantly different from the national rate at the 95% confidence level for 1999-2001 using CIPS file

Indicator (days)	ERA %	Number and (%) trusts outside CIs
1A Day cases 0-29	1	10 (6)
2A Elective with op 0-29	4	29 (18)
3A Elective no op 0-29	3	6 (4)
4A Emergency with op 0-89	10	56 (35)
5A Emergency no op 0-89	12	38 (24)
6A Transfer 0-89	12	4 (3)
8A Elective hip replacement 0-29	7	28 (18)
9A Elective knee replacement 0-29	6	14 (9)
10A Emergency hip/femur 0-89	15	34 (22)

Exhibit 14: Re-admission indicator 1A

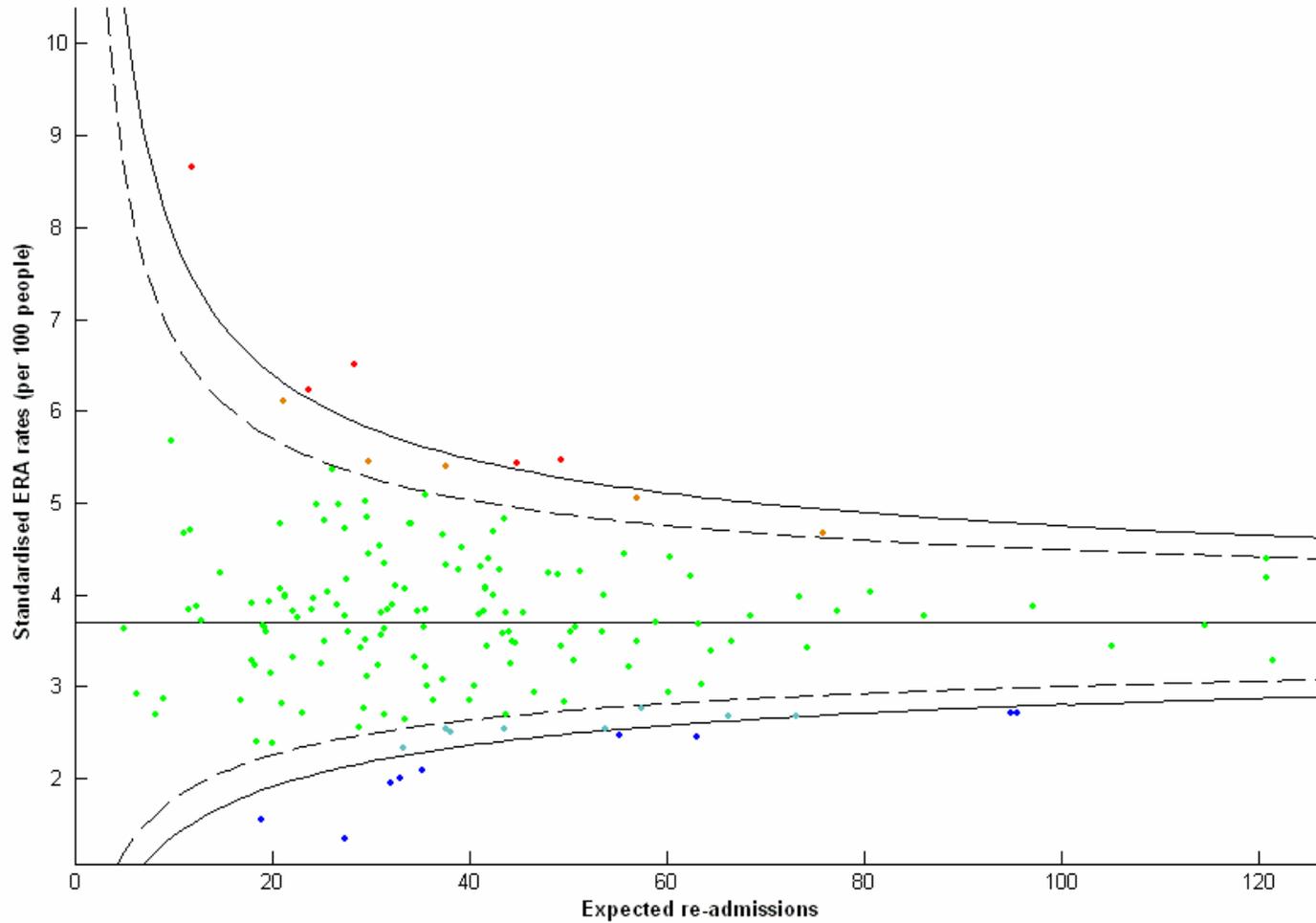
1A 0-29 day ERA for day cases for all causes of re-admissions



Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 15: Re-admission indicator 2A

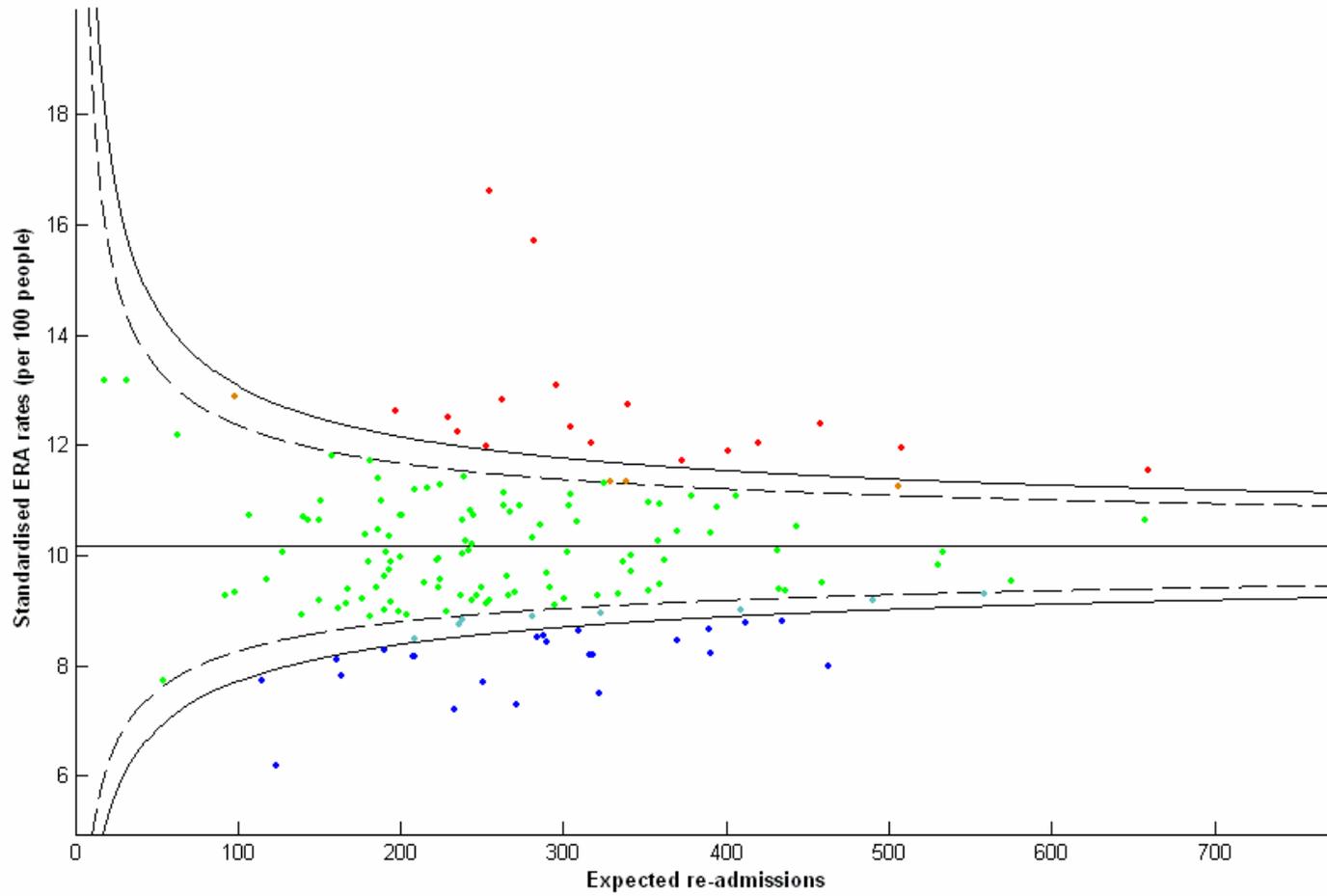
2A 0-29 day ERA for overnight elective admissions which had an operation for all causes of re-admission



Broken and solid lines show 95% and 99% confidence intervals respectively

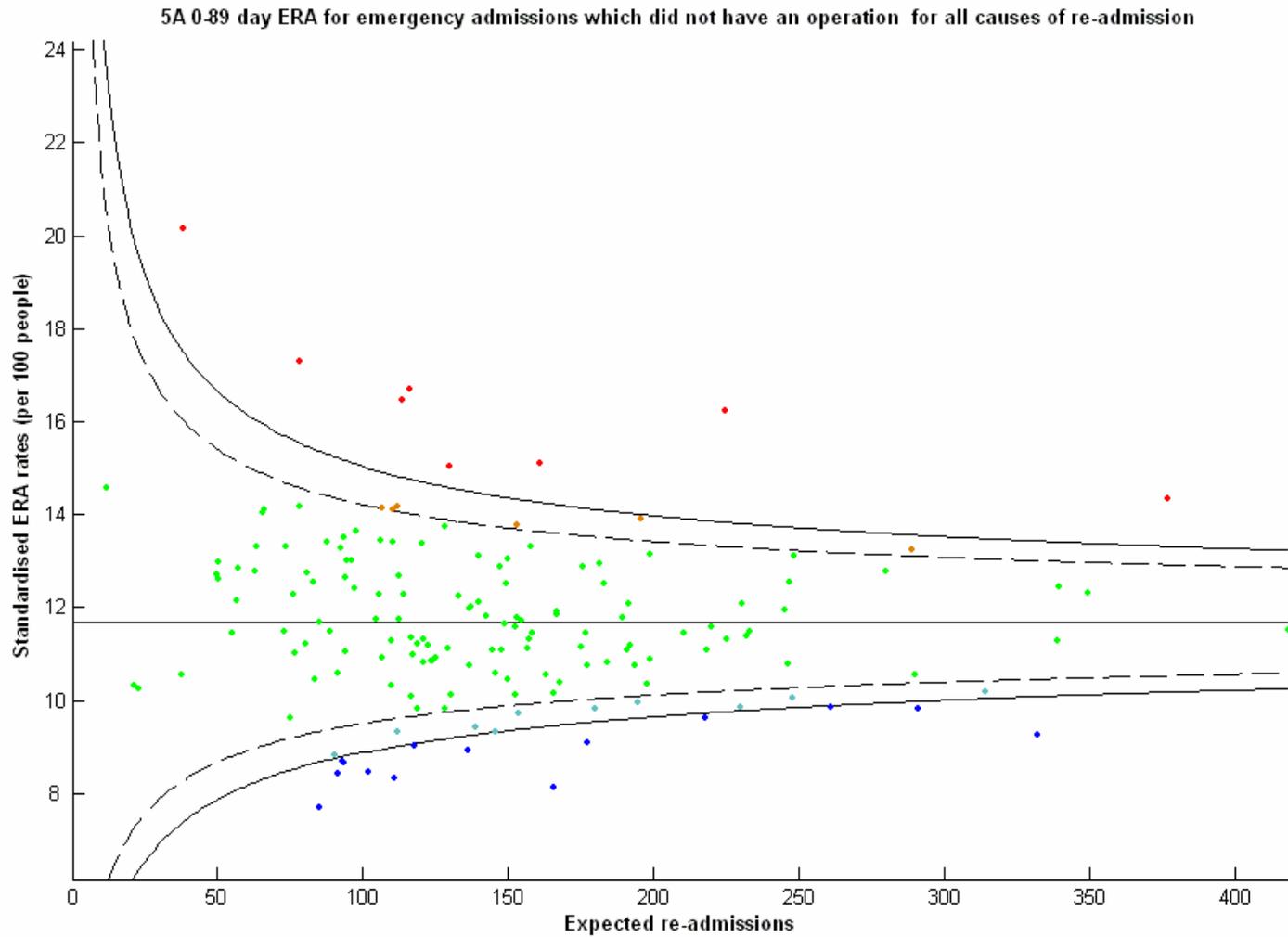
Exhibit 16: Re-admission indicator 4A

4A 0-89 day ERA for emergency admissions which had an operation for all causes of re-admission



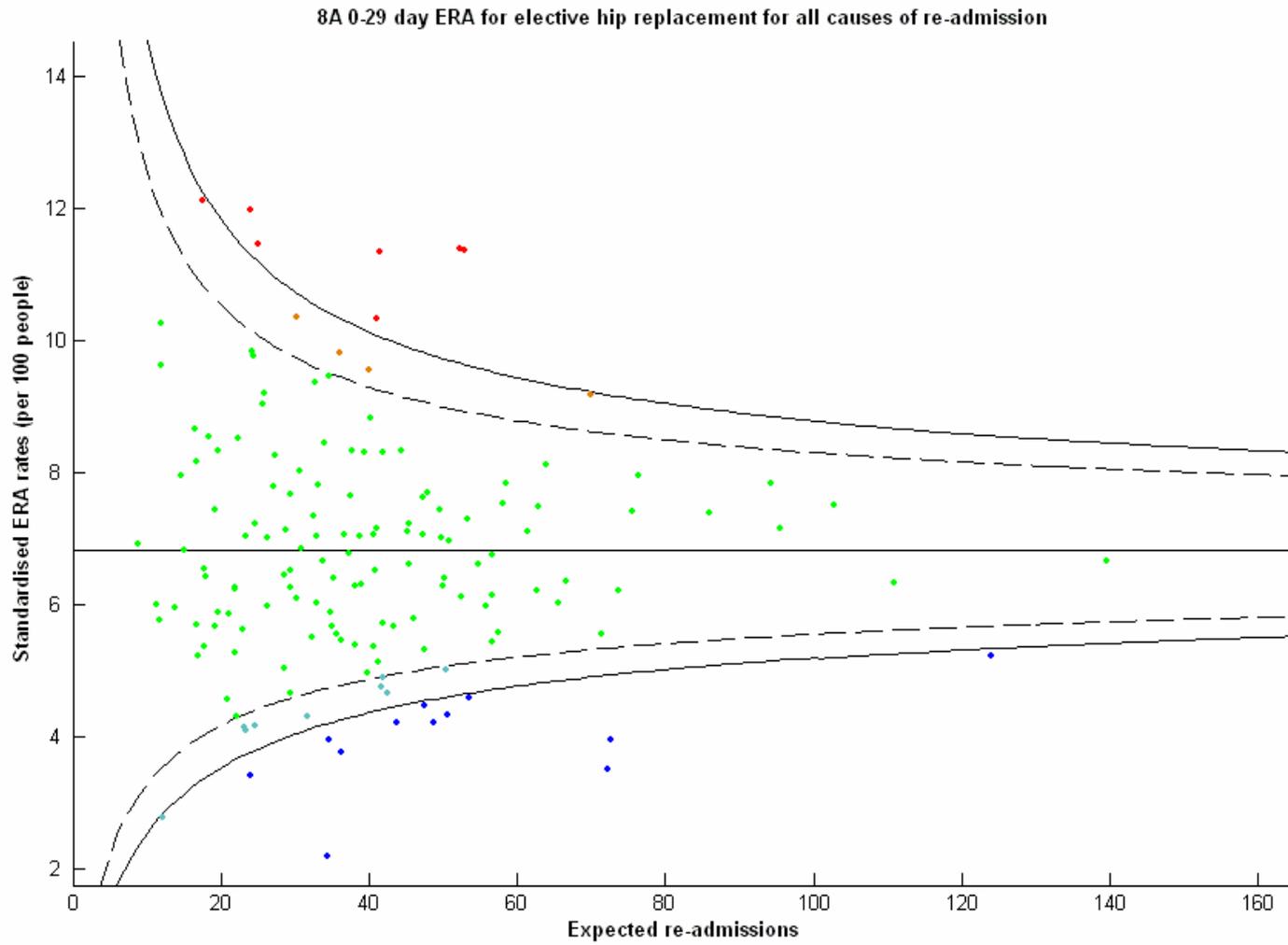
Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 17: Re-admission indicator 5A



Broken and solid lines show 95% and 99% confidence intervals respectively

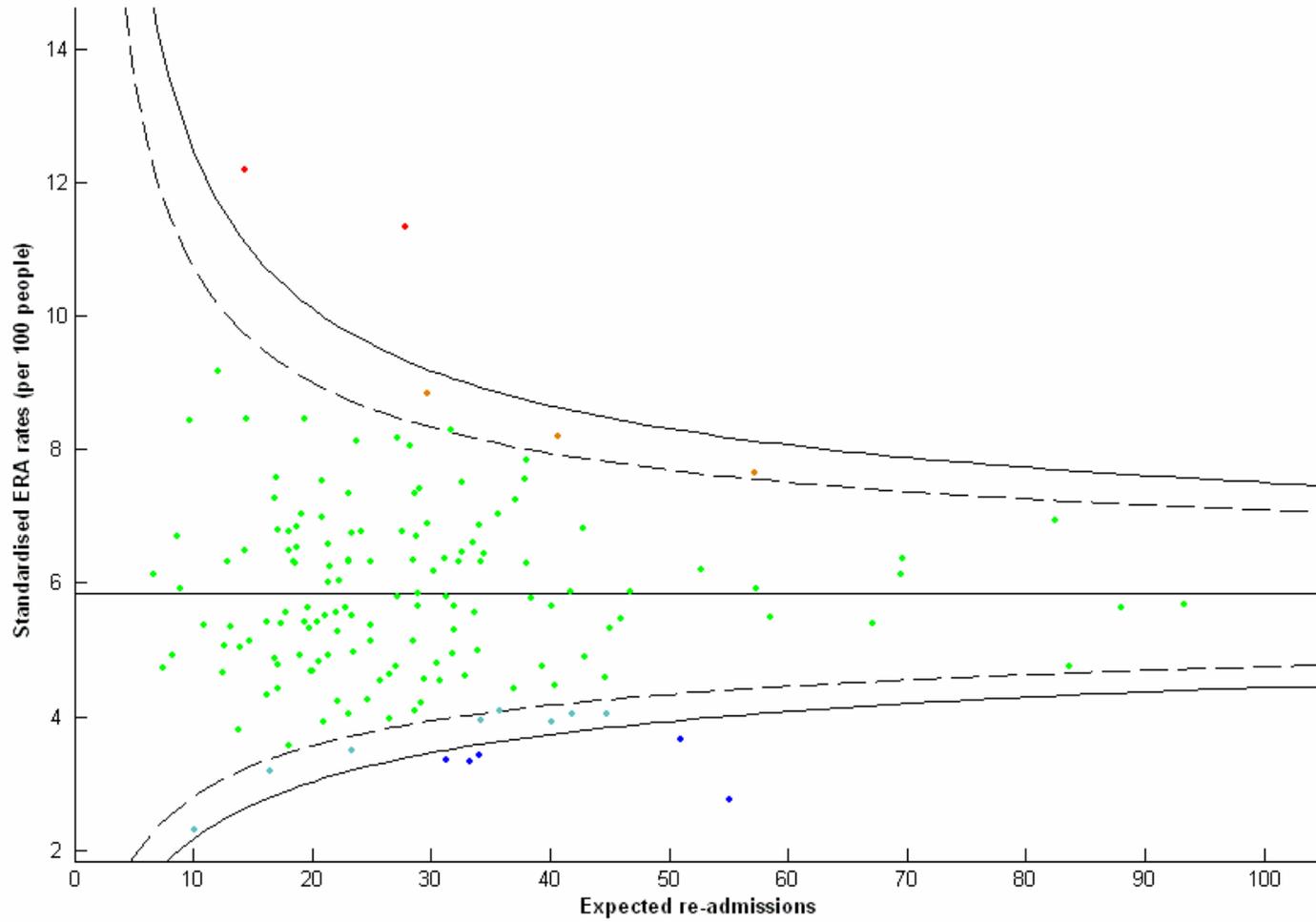
Exhibit 18: Re-admission indicator 8A



Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 19: Re-admission indicator 9A

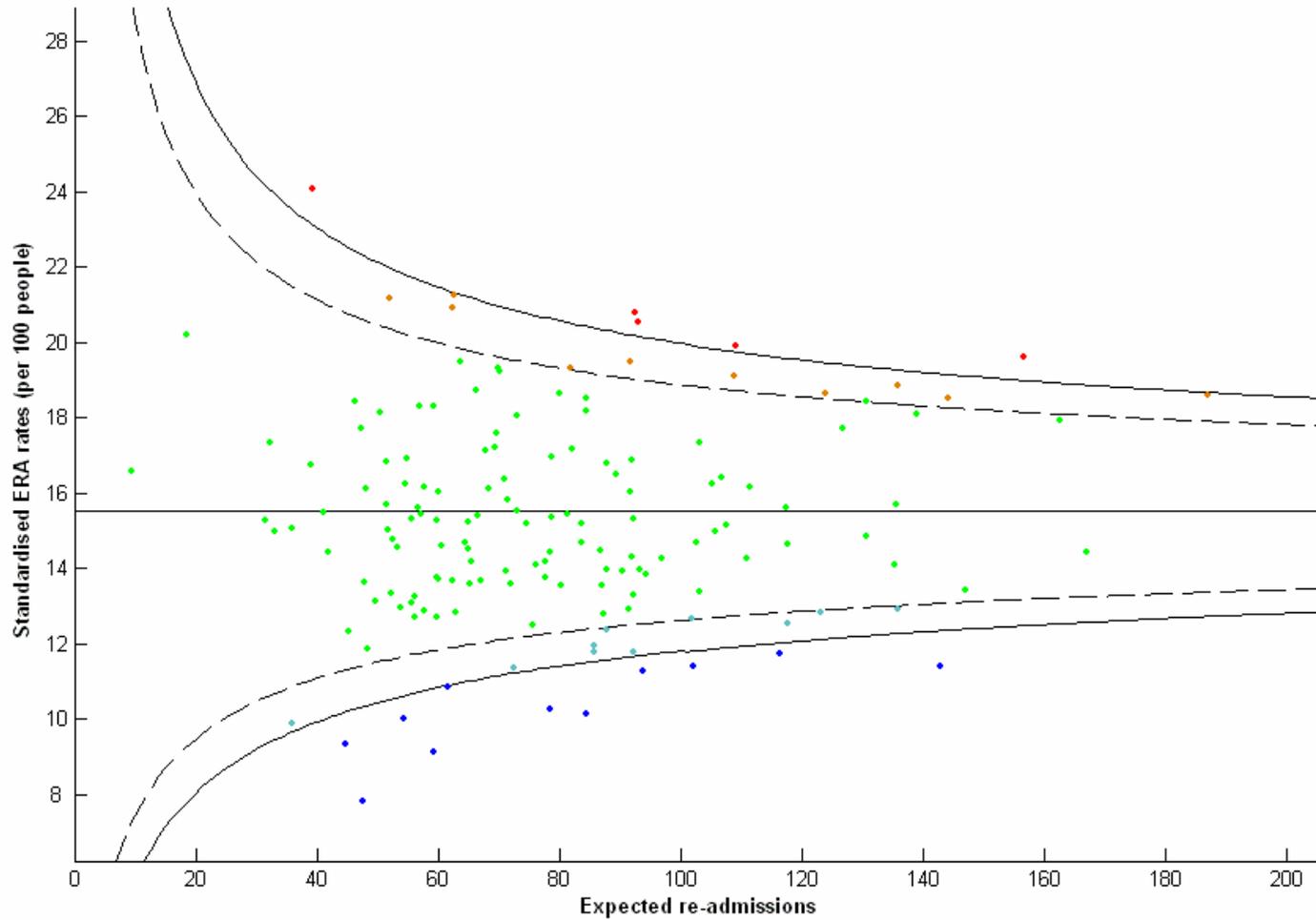
9A 0-29 day ERA for elective knee replacement for all causes of re-admission



Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 20: Re-admission indicator 10A

10A 0-89 day ERA for emergency admissions for hip/femur procedures for all causes of re-admission



Broken and solid lines show 95% and 99% confidence intervals respectively

7. OUTLIER TRUSTS AND RECOMMENDATIONS

Outlier trusts

Exhibit 21 shows for emergency admission indicators 4A, 5A and 10A those trusts that had CFR values higher (marked H) or lower (marked L) than the national rate at the 95% significance level.

Exhibit 22 shows for elective admission indicators 8A and 9A, the few trusts that had higher (marked H) CFR values than the national rate at the 95% significance level.

Exhibit 23 shows for emergency admission indicators 4A, 5A and 10A those trusts that had ERA rate values higher (marked H) or lower (marked L) than the national rate at the 95% significance level.

Exhibit 24 shows for elective admission indicators 1A, 2A, 8A and 9A those trusts that had ERA rate values higher (marked H) or lower (marked L) than the national rate at the 95% significance level.

Recommendations

Following discussions with the collaborating clinicians it is recommended that:

- CFRs should not be used as outcome indicators to screen elective admission activity. There are insufficient deaths for the results to be clinically relevant.
- Three 0-89 day CFRs for screening emergency admissions should be used. They are for:
 - emergencies with an operation
 - emergencies without an operation
 - emergencies with hip/femur procedures.
- Further work should be done on CFRs for cases that are transferred into units, particularly to trauma units that have high levels of transfer.

Great care is required in interpreting the results of comparative ERA rate analyses. It is recommended that the following indicators could be used for comparing trust performance:

- General indicators:
 - day cases
 - elective admissions with an operation
 - emergency admissions with an operation
 - emergency admissions without an operation.
- High volume operations:
 - elective hip replacements
 - elective knee replacements
 - emergency hip/femur procedures.

The more clinically specific an indicator, the less case-mix and disease severity are likely to be confounders. The most specific measures of this set of indicators are ERA rates for day cases and the specified groups of operations.

Exhibit 21: Trusts with two or more standardised case fatality rates (SCFRs) significantly different from the national fatality rate for emergency admission mortality indicators. H and L denote a SCFR significantly higher and lower than the national fatality rate respectively. Statistical significance was assessed using 95% confidence intervals which were based on a Poisson distribution on the observed number of deaths.

EMERGENCY ADMISSION INDICATORS

Trust	4A	5A	10A	number Hs
ST HELENS & KNOWSLEY	H	H	H	3
UNIVERSITY BIRMINGHAM	H	H	H	3
BARNESLEY DISTRICT	H		H	2
BIRMINGHAM HEARTLANDS & SOLIHULL	H		H	2
BRADFORD	H		H	2
ESSEX RIVERS		H	H	2
GATESHEAD	H		H	2
GEORGE ELIOT	H		H	2
MEDWAY	H	H		2
NORTHERN GENERAL	H		H	2
PINDERFIELDS & PONTEFRACT	H	H		2
ROTHERHAM GENERAL	H		H	2
ST GEORGE'S	H	H		2
SWINDON & MARLBOROUGH		H	H	2
THE KINGS MILL CENTRE	H	L	H	2
QUEEN'S MEDICAL CENTRE NOTTINGHAM		L	H	1
Trust	4A	5A	10A	number Ls
CHELSEA & WESTMINSTER	L	L		2
GUY'S & ST THOMAS'	L		L	2
KINGS LYNN & WISBECH	L	L		2
MID SUSSEX		L	L	2
NORTH WEST LONDON	L		L	2
NORTHALLERTON		L	L	2
NUFFIELD ORTHOPAEDIC	L	L		2
ROYAL DEVON & EXETER	L		L	2
ROYAL FREE HAMPSTEAD	L		L	2
ROYAL SHREWSBURY	L		L	2

Trust	4A	5A	10A	number Ls
ROYAL SURREY COUNTY	L		L	2
SOUTHERN DERBYSHIRE		L	L	2
TAUNTON & SOMERSET		L	L	2
UNIVERSITY COLLEGE LONDON	L		L	2
WESTON AREA		L	L	2
WHITTINGTON	L		L	2
WIRRAL	L	L		2
YORK	L		L	2
COUNTESS OF CHESTER	L	L	L	3
EAST GLOUCESTERSHIRE	L	L	L	3
HEREFORD	L	L	L	3
PETERBOROUGH	L	L	L	3

Exhibit 22: Trusts with standardised case fatality rates (SCFRs) significantly higher (H) than the national fatality rate for elective admission mortality indicators. Statistical significance was assessed using 95% confidence intervals which were based on a Poisson distribution on the observed number of deaths.

ELECTIVE ADMISSION INDICATORS

Trust	8A	9A	Number of Hs
BARNSELY DISTRICT	H		1
GEORGE ELIOT		H	1
NORFOLK & NORWICH		H	1
NORTHERN GENERAL	H		1
SCARBOROUGH & NE YORKSHIRE	H		1
SOUTH BUCKINGHAMSHIRE		H	1

Exhibit 23: Trusts with two or more standardised emergency re-admission rates (ERAs) significantly different from the national ERA rate for indicators 4A, 5A and 10A. H and L denote an ERA significantly higher and lower than the national ERA rate respectively. Statistical significance was assessed using 95% confidence intervals which were based on a Poisson distribution on the observed number of re-admissions.

EMERGENCY ADMISSSION INDICATORS

Trust	4A	5A	10A	Number Hs/Ls
BLACKBURN HYNDBURN & RIBBLE VALLEY	H	H	H	3
FOREST	H	H	H	3
ROYAL LIVERPOOL AND BROADGREEN	H	H	H	3
BARTS & THE LONDON	H	H		2
GUY'S & ST THOMAS'	H	H		2
LEEDS TEACHING	H		H	2
NORTHUMBRIA	H		H	2
OLDHAM	H		H	2
PINDERFIELDS & PONTEFRACT	H		H	2
SALFORD ROYAL	H	H		2
SOUTHAMPTON UNIVERSITY	H	H		2
SOUTHEND	H	H		2
ST HELENS & KNOWSLEY	H		H	2
THE KINGS MILL CENTRE	H		H	2
WIRRAL	H	H		2
ASHFORD & ST PETER'S	L		L	2
BRIGHTON	L	L		2
CHELSEA & WESTMINSTER	L	L		2
EAST GLOUCESTERSHIRE	L	L		2
EASTBOURNE		L	L	2
EPSOM & ST HELIER	L		L	2
GLOUCESTERSHIRE ROYAL	L	L		2
ISLE OF WIGHT	L		L	2
NORTH STAFFORDSHIRE	L	L		2
QUEEN MARY'S SIDCUP	L	L		2
ROYAL UNITED BATH	L		L	2
SURREY & SUSSEX	L		L	2
COUNTESS OF CHESTER	L	L	L	3
HEREFORD	L	L	L	3
KINGS LYNN & WISBECH	L	L	L	3

Trust	4A	5A	10A	Number Hs/Ls
MID SUSSEX NHS TRUST	L	L	L	3
NORTH WEST LONDON HOSPITALS	L	L	L	3
OXFORD RADCLIFFE HOSPITAL	L	L	L	3
ROYAL DEVON & EXETER HEALTHCARE	L	L	L	3
ROYAL SURREY COUNTY HOSPITAL	L	L	L	3

Exhibit 24: Trusts with two or more standardised emergency re-admission rates (ERAs) significantly different from the national ERA rate for indicators 1A, 2A, 8A and 9A. H and L denote an ERA significantly higher and lower than the national ERA rate respectively. Statistical significance was assessed using 95% confidence intervals which were based on a Poisson distribution on the observed number of re-admissions.

ELECTIVE ADMISSION INDICATORS

Trust	1A	2A	8A	9A	Number Hs/Ls
SOUTHEND	H	H	H		3
BURY			H	H	2
MILTON KEYNES		H	H		2
NORTHERN GENERAL		H	H		2
SCUNTHORPE & GOOLE		H	H		2
SOUTH TEES		H		H	2
THE KINGS MILL CENTRE		H	H		2
ASHFORD & ST PETER'S		L	L		2
BRIGHTON		L	L		2
EPSOM & ST HELIER			L	L	2
OXFORD RADCLIFFE		L	L		2
ROYAL ORTHOPAEDIC		L	L		2
SALISBURY		L	L		2
THE ROYAL WOLVERHAMPTON			L	L	2
WORTHING & SOUTHLANDS			L	L	2
DUDLEY		L	L	L	3
ESSEX RIVERS		L	L	L	3

ANNEX A: OPCS4 CODES EXCLUDED FROM GROUPS WITH OPERATIONS

A18	Diagnostic endoscopic exam of ventricle of brain	M47	Urethral catheterisation of bladder
A52	Therapeutic epidural injection	M77	Diagnostic endoscopic exam of urethra
ASS	Diagnostic spinal puncture	Q12	Intrauterine contraceptive device
A84	Neurophysiological operations	Q55	Exam of female genital tract
B32	Biopsy of breast	R02	Diagnostic endoscopic exam of foetus
B37	Other operations on breast	R05	Diagnostic percut exam of foetus
E25	Diagnostic endoscopic exam of pharynx	R14	Surgical induction of labour
E36	Diagnostic endoscopic exam of larynx	R15	Other induction of labour
E42.3	Exteriorisation of trachea - temporary tracheostomy	R24	Normal delivery
E49	Diagnostic fiberoptic endoscopic exam of lower resp tract	R27	Other operations to facilitate delivery
E51	Diagnostic endoscopic exam of lower resp tract using rigid bronchoscope	S13	Punch biopsy of skin
E63	Diagnostic endoscopic exam of mediastinum	S14	Shave biopsy of skin
G16	Diagnostic fiberoptic endoscopic exam of oesophagus	S15	Other biopsy of skin
G19	Diagnostic endoscopic exam of oesophagus using rigid oesophagoscope	S50	Introduction of other inert substance into subcutaneous tissue
G45	Diagnostic fiberoptic endoscopic exam of UGI tract	S51	Introduction of destructive substance into subcutaneous tissue
G55	Diagnostic endoscopic exam of duodenum	S52	Introduction of therapeutic substance into subcutaneous tissue
G65	Diagnostic endoscopic exam of jejunum	S53	Introduction of substance into skin
G80	Diagnostic endoscopic exam of ileum	T11	Diagnostic endoscopic exam of pleura
H22	Diagnostic endoscopic exam of colon	T12	Puncture of pleura
H25	Diagnostic endoscopic exam of lower bowel using fiberoptic sigmoidoscope	T43	Diagnostic endoscopic exam of peritoneum
H28	Diagnostic endoscopic exam of colon using rigid sigmoidoscope	T46	Other drainage of peritoneal cavity
J09	Diagnostic endoscopic exam of liver using laparoscope	T81	Biopsy of muscle
J13	Diagnostic percut liver operation	T86	Lymph node sampling
J25	Diagnostic percut gall bladder operation	T90	Lymphangiography
J43	Diagnostic endoscopic retro exam of bile & pancreatic duct	V47	Biopsy of spine
J44	Diagnostic endoscopic retro exam of bile duct	V49	Exploration of spine
J45	Diagnostic endoscopic retro exam of pancreatic duct	W36	Diagnostic bone puncture
J67	Diagnostic percut pancreatic operation	W87	Diagnostic endoscopic exam of knee joint
K58	Diagnostic transluminal heart operation	W88	Diagnostic endoscopic exam of other joint
L71.4	Therapeutic transluminal artery operation	X29	Cont infusion of therapeutic substance
L72	Diagnostic transluminal artery operation (not femoral/iliac)	X30- X39	Injection/transfusion
L91	Other vein related operations	X40- X49	Dialysis/donation
L95	Diagnostic transluminal vein operation	X50	External resuscitation
M11	Diagnostic endoscopic exam of kidney	X51	Body temperature change
M30	Diagnostic endoscopic exam of ureter	X55.8	Other operations on unspecified organ other specified
M45	Diagnostic endoscopic exam of bladder	X55.9	Other operations on unspecified organ other unspecified

Z and Y codes (sites and methods) are also excluded from these indicators.

**ANNEX B: FREQUENCY OF OPERATIVE PROCEDURE CODES
(LESS ADMISSIONS WITH CANCER DIAGNOSES)**

Diagnostic codes shown in italics are those listed in Annex A

ELECTIVE ADMISSIONS LESS DAY CASES

Operative procedure codes		Per annum
Code	Name	
A52	<i>Therapeutic epidural injection</i>	2422
A55	<i>Diagnostic spinal puncture</i>	283
A57	Operations on spinal nerve root	344
A61	Extirpation of lesion of peripheral nerve	622
A64	Other repair of peripheral nerve	153
A65	Release of entrapment of peripheral nerve at wrist	3722
A67	Release of entrapment of peripheral nerve at other site	469
A68	Other release of peripheral nerve	695
A73	Other operations on peripheral nerve	1071
A81	Other operations on sympathetic nerve	189
B28	Other excision of breast	147
C71	Extracapsular extraction of lens	1521
C75	Prosthesis of lens	1543
C82	Destruction of lesion of retina	126
E49	<i>Diagnostic endoscopic examination of lower respiratory tract</i>	176
F09	Surgical removal of tooth	182
G45	<i>Diagnostic endoscopic examination of upper gastrointestinal tract</i>	3043
H22	<i>Diagnostic endoscopic examination of colon</i>	733
H25	<i>Diagnostic endoscopic exam of lower bowel using fiberoptics</i>	654
H28	<i>Diagnostic endoscopic examination of sigmoid colon using rigid</i>	175
J18	Excision of gall bladder	136
K63	Contrast radiology of heart	289
L63	Transluminal operations on femoral artery	169
L87	Other operations on varicose vein of leg	135
L91	<i>Other vein related operations</i>	277
L95	<i>Diagnostic transluminal operations on vein</i>	1153
M45	<i>Diagnostic endoscopic examination of bladder</i>	1362
M47	<i>Urethral catheterisation of bladder</i>	2034
M65	Endoscopic resection of outlet of male bladder	285
P23	Other repair of prolapse of vagina	126
Q18	Diagnostic endoscopic examination of uterus	360
S06	Other excision of lesion of skin	2185
S08	Curettage of lesion of skin	136
S15	<i>Other biopsy of skin</i>	199
S23	Flap operations to relax contracture of skin	340
S35	Split autograft of skin	189
S36	Other autograft of skin	281
S42	Suture of skin of other site	372
S43	Removal of repair material from skin	237
S44	Removal of other inorganic substance from skin	170
S47	Opening of skin	694
S52	<i>Introduction of therapeutic substance into subcutaneous tissue</i>	128
S57	Exploration of other skin of other site	1690

S60	Other operations on skin	186
S64	Extirpation of nail bed	418
S68	Excision of nail	272
S70	Other operations on nail	195
T20	Primary repair of inguinal hernia	327
T52	Excision of other fascia	4751
T54	Division of fascia	465
T55	Release of fascia	325
T59	Excision of ganglion	1039
T62	Operations on bursa	953
T64	Transposition of tendon	1354
T65	Excision of tendon	185
T67	Primary repair of tendon	1320
T68	Secondary repair of tendon	130
T69	Freeing of tendon	743
T70	Adjustment to length of tendon	3275
T71	Excision of sheath of tendon	155
T72	Other operations on sheath of tendon	1464
T74	Other operations on tendon	483
T77	Excision of muscle	173
T79	Repair of muscle	1738
T80	Release of contracture of muscle	309
T83	Other operations on muscle	192
T96	Other operations on soft tissue	775
V22	Primary decompression operations on cervical spine	146
V25	Primary decompression operations on lumbar spine	3200
V26	Revisional decompression operations on lumbar spine	236
V29	Primary excision of cervical intervertebral disc	180
V33	Primary excision of lumbar intervertebral disc	4021
V34	Revisional excision of lumbar intervertebral disc	228
V38	Primary fusion of other joint of spine	1387
V39	Revisional fusion of joint of spine	128
V41	Instrumental correction of deformity of spine	1222
V42	Other correction of deformity of spine	334
V50	Manipulation of spine	460
V52	Other operations on intervertebral disc	432
V54	Other operations on spine	1217
W03	Complex reconstruction of forefoot	1093
W04	Complex reconstruction of hindfoot	640
W05	Prosthetic replacement of bone	157
W06	Total excision of bone	1218
W08	Other excision of bone	6522
W09	Extirpation of lesion of bone	1353
W10	Open surgical fracture of bone	135
W12	Angulation periarticular division of bone	274
W13	Other periarticular division of bone	284
W14	Diaphyseal division bone	277
W15	Division of bone of foot	6643
W16	Other division of bone	2132
W17	Other reconstruction of bone	494

W18	Drainage of bone	277
W19	Primary open reduction of fracture of bone/intramedullary fixation	2282
W20	Primary open reduction of fracture of bone/extramedullary fixation	2127
W23	Secondary open reduction of fracture of bone	882
W24	Closed reduction of fracture of bone and internal fixation	1211
W25	Closed reduction of fracture of bone and external fixation	150
W26	Other closed reduction of fracture of bone	1220
W27	Fixation of epiphysis	374
W28	Other internal fixation of bone	15708
W29	Skeletal traction of bone	566
W30	Other external fixation of bone	1471
W31	Other autograft of bone	3531
W32	Other graft of bone	1804
W33	Other open operations on bone	793
W35	Therapeutic puncture of bone	416
W36	<i>Diagnostic puncture of bone</i>	536
W37	Total prosthetic replacement of hip joint using cement	31151
W38	Total prosthetic replacement of hip joint not using cement	4638
W39	Other total prosthetic replacement of hip joint	5270
W40	Total prosthetic replacement of knee joint using cement	25990
W41	Total prosthetic replacement of knee joint not using cement	3067
W42	Other total prosthetic replacement of knee joint	4074
W43	Total prosthetic replacement of other joint using cement	905
W44	Total prosthetic replacement of other joint not using cement	502
W45	Other total prosthetic replacement of other joint	602
W46	Prosthetic replacement of head of femur using cement	569
W47	Prosthetic replacement of head of femur not using cement	448
W48	Other prosthetic replacement of head of femur	177
W49	Prosthetic replacement of head of humerus using cement	542
W50	Prosthetic replacement of head of humerus not using cement	403
W51	Other prosthetic replacement of head of humerus	194
W52	Prosthetic replacement of articulation of other bone using cement	678
W53	Prosthetic replacement of articulation of other bone not using	180
W54	Other prosthetic replacement of articulation of other bone	520
W55	Prosthetic interposition reconstruction of joint	306
W56	Other interposition reconstruction of joint	368
W57	Excision reconstruction of joint	4499
W58	Other reconstruction of joint	1038
W59	Fusion of joint of toe	4467
W60	Fusion of other joint and other extraarticular bone graft	398
W61	Fusion of other joint and other articular bone graft	414
W62	Other primary fusion of other joint	2663
W63	Revisional fusion of other joint	216
W65	Primary open reduction of traumatic dislocation of joint	223
W66	Primary closed reduction of traumatic dislocation of joint	340
W69	Open operations on synovial membrane of joint	996
W70	Open operations on semilunar cartilage	351
W71	Other open operations on intrarticular structure	1199
W74	Other reconstruction of ligament	3508
W75	Other open repair of ligament	492
W76	Other operations on ligament	441
W77	Stabilising operations on joint	3488
W78	Release of contracture of joint	1908

W79	Soft tissue operations on joint of toe	3115
W81	Other open operations on joint	2024
W82	Therapeutic endoscopic operations on semilunar cartilage	8794
W83	Therapeutic endoscopic operations on other articular cartilage	2048
W84	Therapeutic endoscopic operations on other joint structure	6000
W85	Therapeutic endoscopic operations on cavity of knee joint	9946
W86	Therapeutic endoscopic operations on cavity of other joint	1243
W87	<i>Diagnostic endoscopic examination of knee joint</i>	5660
W88	<i>Diagnostic endoscopic examination of other joint</i>	1798
W90	Puncture of joint	6774
W91	Other manipulation of joint	3209
W92	Other operations on joint	1372
X08	Amputation of hand	304
X09	Amputation of leg	226
X11	Amputation of toe	1177
X12	Operations on amputation stump	183
X22	Correction of congenital deformity of hip	769
X24	Primary correction of congenital deformity of foot	842
X25	Other correction of congenital deformity of foot	278
X27	Correction of minor congenital deformity of foot	201
X29	<i>Continuous infusion of therapeutic substance</i>	1119
X30	<i>Injection of therapeutic substance</i>	160
X33	<i>Other blood transfusion</i>	5891
X35	<i>Other intravenous injection</i>	1414
X37	<i>Intramuscular injection</i>	206
X38	<i>Subcutaneous injection</i>	631
X48	<i>Immobilisation using plaster cast</i>	2259
X49	<i>Other immobilisation</i>	324
X50	<i>External resuscitation</i>	128
Y02	<i>Placement of prosthesis in organ not otherwise classifiable</i>	216
Y03	<i>Attention to prosthesis in organ not otherwise classifiable</i>	2620
Y05	<i>Excision of organ not otherwise classifiable</i>	508
Y06	<i>Excision of lesion of organ noc</i>	306
Y08	<i>Laser therapy to organ not otherwise classifiable</i>	234
Y18	<i>Release of organ not otherwise classifiable</i>	635
Y22	<i>Drainage of organ not otherwise classifiable</i>	770
Y26	<i>Other repair of organ noc</i>	451
Y27	<i>Graft to organ not otherwise classifiable</i>	219
Y48	<i>Approach to spine through back</i>	218
Y50	<i>Approach through abdominal cavity</i>	190
Y52	<i>Approach to organ through other artificial opening</i>	1106
Y53	<i>Percutaneous approach to organ under image control</i>	1314
Y58	<i>Harvest of skin for graft</i>	202
Y65	<i>Harvest of tendon</i>	1120
Y66	<i>Harvest of bone</i>	3672
Y70	<i>Early operations not otherwise classifiable</i>	650
Y71	<i>Late operations not otherwise classifiable</i>	1393
Y80	<i>General anaesthetic</i>	3376
Y81	<i>Spinal anaesthetic</i>	2604
Y82	<i>Local anaesthetic</i>	2390
Y90	<i>Other nonoperations</i>	170

Z07	<i>Spinal nerve root</i>	209
Z08	<i>Brachial plexus</i>	127
Z09	<i>Peripheral nerve of arm</i>	1391
Z12	<i>Other nerve</i>	540
Z27	<i>Upper digestive tract</i>	1361
Z28	<i>Large intestine</i>	369
Z29	<i>Other part of bowel</i>	147
Z47	<i>Skin of face</i>	220
Z48	<i>Skin of other part of head or neck</i>	154
Z49	<i>Skin of trunk</i>	542
Z50	<i>Skin of other site</i>	2996
Z54	<i>Muscle of shoulder or upper arm</i>	570
Z55	<i>Muscle of forearm</i>	458
Z56	<i>Muscle of hand</i>	1415
Z57	<i>Muscle of hip or thigh</i>	1166
Z58	<i>Muscle of lower leg</i>	2705
Z59	<i>Muscle of foot</i>	715
Z66	<i>Vertebra</i>	954
Z67	<i>Intervertebral joint</i>	879
Z68	<i>Bone of shoulder girdle</i>	2255
Z69	<i>Humerus</i>	1919
Z70	<i>Radius</i>	2947
Z71	<i>Ulna</i>	1871
Z72	<i>Other bone of arm or wrist</i>	2197
Z73	<i>Other bone of hand</i>	1365
Z75	<i>Bone of pelvis</i>	1452
Z76	<i>Femur</i>	5573
Z77	<i>Tibia</i>	5630
Z78	<i>Other bone of lower leg</i>	2760
Z79	<i>Bone of tarsus</i>	971
Z80	<i>Other bone of foot</i>	2486
Z81	<i>Joint of shoulder girdle or arm</i>	10414
Z82	<i>Joint of wrist or hand</i>	2085
Z83	<i>Joint of finger</i>	1593
Z84	<i>Joint of pelvis or upper leg</i>	13519
Z85	<i>Joint of lower leg or tarsus</i>	4162
Z86	<i>Other joint of foot</i>	2948
Z87	<i>Other part of musculoskeletal system</i>	1100
Z89	<i>Arm region</i>	3252
Z90	<i>Leg region</i>	5107
Z92	<i>Other region of body</i>	183
Z94	<i>Laterality of operation</i>	187005

EMERGENCY ADMISSIONS

	Operative procedure codes	Per annum
Code	Name	
A52	<i>Therapeutic epidural injection</i>	1007
A62	Microsurgical repair of peripheral nerve	200
A64	Other repair of peripheral nerve	1445
A65	Release of entrapment of peripheral nerve at wrist	684
A73	Other operations on peripheral nerve	292
E42	<i>Exteriorisation of trachea</i>	171
G34	Artificial opening into stomach	136
G44	Other therapeutic endoscopy on upper gastrointestinal tract	149
G45	<i>Diagnostic fiberoptic endoscopy of upper gastrointestinal tract</i>	1277
H25	<i>Diagnostic endoscopic exam of lower bowel using fiberoptics</i>	175
L68	Repair of other artery	218
L70	Other open operations on other artery	134
L91	<i>Other vein related operations</i>	463
L95	<i>Diagnostic transluminal operations on vein</i>	662
M45	<i>Diagnostic endoscopic examination of bladder</i>	158
M47	<i>Urethral catheterisation of bladder</i>	2012
S06	Other excision of lesion of skin	359
S08	Curettage of lesion of skin	174
S35	Split autograft of skin	632
S36	Other autograft of skin	150
S41	Suture of skin of head or neck	810
S42	Suture of skin of other site	6657
S43	Removal of repair material from skin	172
S44	Removal of other inorganic substance from skin	2655
S45	Removal of other substance from skin	1089
S47	Opening of skin	5254
S56	Exploration of other skin of head or neck	257
S57	Exploration of other skin of other site	15348
S66	Other operations on nail bed	595
S68	Excision of nail	151
S70	Other operations on nail	342
T12	<i>Puncture of pleura</i>	402
T54	Division of fascia	166
T55	Release of fascia	458
T62	Operations on bursa	558
T67	Primary repair of tendon	8665
T72	Other operations on sheath of tendon	334
T74	Other operations on tendon	205
T79	Repair of muscle	491
T83	Other operations on muscle	134
T96	Other operations on soft tissue	131
V15	Reduction of fracture of mandible	128
V17	Fixation of mandible	137

V25	Primary decompression operations on lumbar spine	290
V33	Primary excision of lumbar intervertebral disc	879
V46	Fixation of fracture of spine	271
V50	Manipulation of spine	147
V54	Other operations on spine	221
W08	Other excision of bone	773
W09	Extirpation of lesion of bone	234
W16	Other division of bone	172
W18	Drainage of bone	192
W19	Primary open reduction of fracture of bone/intramedullary fixation	33676
W20	Primary open reduction of fracture of bone/extramedullary fixation	21530
W21	Primary open reduction of intra-articular fracture of bone	1452
W22	Other primary open reduction of fracture of bone	938
W23	Secondary open reduction of fracture of bone	1156
W24	Closed reduction of fracture of bone and internal fixation	21453
W25	Closed reduction of fracture of bone and external fixation	2469
W26	Other closed reduction of fracture of bone	32271
W27	Fixation of epiphysis	340
W28	Other internal fixation of bone	7801
W29	Skeletal traction of bone	1650
W30	Other external fixation of bone	2136
W31	Other autograft of bone	1240
W32	Other graft of bone	582
W33	Other open operations on bone	2281
W35	Therapeutic puncture of bone	185
W36	<i>Diagnostic puncture of bone</i>	233
W37	Total prosthetic replacement of hip joint using cement	1656
W38	Total prosthetic replacement of hip joint not using cement	341
W39	Other total prosthetic replacement of hip joint	3594
W40	Total prosthetic replacement of knee joint using cement	254
W42	Other total prosthetic replacement of knee joint	344
W46	Prosthetic replacement of head of femur using cement	9702
W47	Prosthetic replacement of head of femur not using cement	8940
W48	Other prosthetic replacement of head of femur	1734
W49	Prosthetic replacement of head of humerus using cement	337
W57	Excision reconstruction of joint	437
W65	Primary open reduction of traumatic dislocation of joint	1593
W66	Primary closed reduction of traumatic dislocation of joint	4887
W67	Secondary reduction of traumatic dislocation of joint	338
W75	Other open repair of ligament	766
W77	Stabilising operations on joint	248
W81	Other open operations on joint	1520
W82	Therapeutic endoscopic operations on semilunar cartilage	1531
W83	Therapeutic endoscopic operations on other articular cartilage	138
W84	Therapeutic endoscopic operations on other joint structure	266
W85	Therapeutic endoscopic operations on cavity of knee joint	2471
W86	Therapeutic endoscopic operations on cavity of other joint	179
W87	<i>Diagnostic endoscopic examination of knee joint</i>	1144
W88	<i>Diagnostic endoscopic examination of other joint</i>	139
W90	Puncture of joint	4015
W91	Other manipulation of joint	2275
W92	Other operations on joint	2137

X08	Amputation of hand	823
X09	Amputation of leg	287
X11	Amputation of toe	293
X12	Operations on amputation stump	164
X29	<i>Continuous infusion of therapeutic substance</i>	2814
X33	<i>Other blood transfusion</i>	4982
X35	<i>Other intravenous injection</i>	3378
X38	<i>Subcutaneous injection</i>	140
X48	<i>Immobilisation using plaster cast</i>	8397
X49	<i>Other immobilisation</i>	2414
X55	<i>Other operations on unspecified organ</i>	166
Y03	<i>Attention to prosthesis in organ not otherwise classifiable</i>	3343
Y05	<i>Excision of organ not otherwise classifiable</i>	150
Y22	<i>Drainage of organ not otherwise classifiable</i>	1955
Y53	<i>Percutaneous approach to organ under image control</i>	5475
Y58	<i>Harvest of skin for graft</i>	198
Y66	<i>Harvest of bone</i>	962
Y70	<i>Early operations not otherwise classifiable</i>	196
Y71	<i>Late operations not otherwise classifiable</i>	380
Y80	<i>General anaesthetic</i>	2631
Y81	<i>Spinal anaesthetic</i>	1516
Y82	<i>Local anaesthetic</i>	971
Y90	<i>Other nonoperations</i>	354
Z09	<i>Peripheral nerve of arm</i>	1335
Z27	<i>Upper digestive tract</i>	424
Z47	<i>Skin of face</i>	332
Z48	<i>Skin of other part of head or neck</i>	340
Z49	<i>Skin of trunk</i>	527
Z50	<i>Skin of other site</i>	15224
Z54	<i>Muscle of shoulder or upper arm</i>	193
Z55	<i>Muscle of forearm</i>	919
Z56	<i>Muscle of hand</i>	4287
Z57	<i>Muscle of hip or thigh</i>	538
Z58	<i>Muscle of lower leg</i>	2169
Z59	<i>Muscle of foot</i>	143
Z66	<i>Vertebra</i>	285
Z67	<i>Intervertebral joint</i>	168
Z68	<i>Bone of shoulder girdle</i>	568
Z69	<i>Humerus</i>	6610
Z70	<i>Radius</i>	26298
Z71	<i>Ulna</i>	7520
Z72	<i>Other bone of arm or wrist</i>	7177
Z73	<i>Other bone of hand</i>	5624
Z75	<i>Bone of pelvis</i>	448
Z76	<i>Femur</i>	8913
Z77	<i>Tibia</i>	11610
Z78	<i>Other bone of lower leg</i>	8897
Z79	<i>Bone of tarsus</i>	1075
Z80	<i>Other bone of foot</i>	974
Z81	<i>Joint of shoulder girdle or arm</i>	4585
Z82	<i>Joint of wrist or hand</i>	2268

Z83	<i>Joint of finger</i>	1485
Z84	<i>Joint of pelvis or upper leg</i>	6628
Z85	<i>Joint of lower leg or tarsus</i>	3887
Z86	<i>Other joint of foot</i>	354
Z87	<i>Other part of musculoskeletal system</i>	309
Z89	<i>Arm region</i>	5791
Z90	<i>Leg region</i>	5556
Z92	<i>Other region of body</i>	261
Z94	<i>Laterality of operation</i>	174931